

**GENERAL SPECIFICATIONS**

**99.3. PROJECT ADMINISTRATION REQUIREMENTS****99.3.1. Project Administration Requirements****99.3.1.1. Cooperation and Coordination of Work**

99.3.1.1.1. The Contractor's attention is directed to other construction, including the construction of building(s), the installation and/or relocation of UTILITIES, etc., which may be carried on simultaneously with the work under this CONTRACT, and that because of such other work, he may not have exclusive occupancy of the territory within or adjacent to the limits of the CONTRACT. The Contractor shall cooperate with other contractors and the owners of the various UTILITIES, and shall coordinate and arrange the sequence of his work to conform with the progressive operations of the work under other CONTRACTS.

99.3.1.1.2. Cooperation and adjustments with such other contractors is essential to properly coordinate the construction efforts of all contractors, UTILITY owners and subcontractors engaged in the work within and/or adjacent to the construction area of this CONTRACT. In case of interference between the operations of different contractors, UTILITY owners and subcontractors, the ENGINEER will be the sole judge of the rights of each and the sequence of work necessary to expedite the completion of the project, and in all cases his decision shall be accepted as final.

99.3.1.1.3. Prior to Bidding, the Contractor shall make himself aware of the nature and extent of the work to be performed by these other contractors, subcontractors and UTILITY owners, other Projects in the immediate area, and especially how such will affect the work that he will be performing under this CONTRACT.

99.3.1.1.4. The Contractor shall maintain reasonable access to the site at all times for the owner(s), abutting properties, and other contractors on the project.

**99.3.1.2. Schedule of Operations**

99.3.1.2.1. Prior to the start of construction, the Contractor shall submit a detailed Schedule of Construction Operations and completion dates for each phase of his operations to the ENGINEER. No work shall be started until the ENGINEER has approved this schedule.

99.3.1.2.2. No time extensions will be granted for the completion of any operation where the ENGINEER finds cause to suspend the performance of any or all construction because of non-compliance with the Specifications.

99.3.1.3. **Job Conferences** – The ENGINEER shall fix a mutually acceptable time and place for job conferences, which shall be attended by all contractors and their subcontractors. The ENGINEER shall prepare a Job conference Report containing the minutes of the conference, detailing items discussed and decisions rendered. A pre-conference meeting prior to construction is required. Copies of the Job Conference reports will be delivered promptly to all contractors, subcontractors, the TOWNSHIP and other affected parties.

99.3.1.4. **Project Records**

99.3.1.4.1. Each Contractor and subcontractor shall maintain and submit daily logs of his activities on the project. The daily log shall include a statement of men and equipment used, work completed and conditions encountered.

99.3.1.4.2. The Contractor shall furnish to the ENGINEER, on a daily basis, copies of delivery tickets for all materials used on the project.

99.3.1.5. **Construction Photographs**

99.3.1.5.1. The Contractor may be required, by provisions in the Project Specifications, to furnish the services of a photographer to provide a pictorial log of the project. Color photographs shall be taken under the general supervision of the ENGINEER.

99.3.1.5.2. CD or DVD format shall be provided with each picture adequately described with date, location, subject matter, and technical comments. All CD or DVD shall be presented to the TOWNSHIP.

99.3.1.5.3. Photographs shall be taken of locations before, during and after work is done in easements, on or adjacent to property lines and existing facilities.

99.3.1.5.4. Photographs shall be taken of any and all unusual conditions encountered.

99.3.2. **Site Preparation**

99.3.2.1. **Description**

99.3.2.1.1. **Scope**

99.3.2.1.1.1. Work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment for preparing the site for construction in accordance with the CONTRACT Documents. This shall include, but not be limited to:

- 99.3.2.1.1.1. Clearing and Grubbing
- 99.3.2.1.1.1.2. Removal of structures, obstructions and UTILITIES
- 99.3.2.1.1.1.3. Protection of existing structures and UTILITIES to remain
- 99.3.2.1.1.1.4. Protection of existing trees, landscaping and natural features to remain
- 99.3.2.1.1.1.5. Maintenance and protection of traffic
- 99.3.2.1.1.1.6. Construction and maintenance of access roads, construction roads and staging areas.
- 99.3.2.1.1.1.7. Dust and mud control.
- 99.3.2.1.1.1.8. Township may require verification of Approved Disposal Site

## 99.3.2.2. **Construction Details**

### 99.3.2.2.1. **General**

99.3.2.2.1.1. **Locations shown in Drawings not Guaranteed** – the structures, obstructions, UTILITIES, trees and shrubs shown on the Drawings are those known to exist, but their location is not guaranteed to be exact, nor is it guaranteed that all structures, obstructions, UTILITIES, trees and shrubs are shown. The Contractor shall, however, be responsible for the protection of all structures, obstructions, UTILITIES, trees and shrubs, whether shown on the Drawings or not.

99.3.2.2.1.2. **Safeguards and Protection** – the Contractor shall provide all necessary safeguards including the installation of shoring, structural supports, protective fencing and barriers, etc., as may be required to prevent damage to adjacent property or injury to persons. All work shall be performed in accordance with the requirements of the local building codes and the rules, regulations, and ordinances of all other governing bodies having jurisdiction. The Contractor will be held responsible for any claim arising from Contractor's failure to provide proper safeguards, or for Contractor's failure to conduct the operation in a manner consistent with the rules, regulations and ordinances of these governing bodies having jurisdiction.

99.3.2.2.1.3. **Replacement of Disturbed Ground Surfaces** – the Contractor shall, at Contractor's own expense, repair or replace all ground surfaces, pavements, SIDEWALKS, curbs, etc., which are to remain and which become disturbed or damaged due to operations. Said repair or replacement shall be satisfactory to the ENGINEER and in accordance with the requirements of all governing bodies having jurisdiction.

99.3.2.2.1.4. **Damage** – the Contractor shall, at Contractor’s own expense, make good, repair and/or replace all damage occurring as a direct or indirect result of his operations.

99.3.2.2.1.5. **Notification of UTILITY Owners** – the Contractor shall notify all UTILITY owners at least seventy-two (72) hours prior to the start of any operation that will affect their lines, whether to remain or to be discontinued, removed, relocated and/or reconstructed and at all other times as may be specified by law. The Contractor will be held responsible for any claims arising from Contractor’s failure to make such notification, or for Contractor’s failure to do the work in accordance with the rules and regulations of the governing authorities.

99.3.2.2.1.6. **Demolition** – all structures and buildings designated for disposal shall be demolished on site. Unless otherwise specified, the salvage value of all materials in these structures and buildings shall accrue to the Contractor and shall be reflected in the Proposal values.

99.3.2.2.1.7. **Highway Occupancy Permits** – the Contractor shall obtain any required State or County Highway Occupancy Permits (if not previously obtained by the TOWNSHIP) and comply with all standard conditions and special requirements of the Permit.

99.3.2.2.2. **Clearing and Grubbing**

99.3.2.2.2.1. **General Requirements** – except for the existing trees which have been marked “To Be Saved” the area within the limits of earthwork shall be cleared of trees, logs, stumps, brush, vegetation, rubbish, and other perishable or objectionable materials, as directed by the ENGINEER as shown on the plans.

99.3.2.2.2.2. **Disposal** – all materials obtained from clearing and grubbing shall become the property of the Contractor and, unless otherwise specified, shall be disposed of off site in an approved disposal site, subject to local codes. No grubbed organic material shall be buried on the site. Township may require verification of approved disposal site.

99.3.2.2.2.3. **Burning** – no burning will be permitted on the site.

99.3.2.2.3. **Removal of Structures, UTILITIES and Obstructions**

99.3.2.2.3.1. **General Requirements** – the Contractor shall remove and dispose of those existing structures, UTILITIES and obstructions

which interfere with the proposed construction as shown on the Drawings, and as determined in the field by the ENGINEER. This shall include, but not necessarily be limited to, buildings, building foundations, fences, guard rails, walls, poles, pole bases, catch basins, inlets, manholes, vaults, tanks, conduit, pipes, and appurtenances, floor slabs, pavements, SIDEWALKS, curbs, signs, mailboxes, brick pillars and sign supporting structures. Any mailbox or support that will be affected by the scope of work will be removed according to the TOWNSHIP standards.

The Contractor shall remove only those items and structures that the Contractor has been authorized to remove, either by specific instructions given on the Drawings, or by written instruction before or during the progress of the Work by the ENGINEER.

The Contractor will be held responsible for the removal of any existing item or structure without the required authorization specified herein.

99.3.2.2.3.2. **Discontinuance of UTILITIES** – before any structure or building with UTILITIES therein is disposed of, the UTILITIES shall be removed by the Contractor in accordance with the directions of the authorities having jurisdiction of the facilities. Verification of utility company's disconnection shall be in accordance with the TOWNSHIP Code requirements.

Unless otherwise directed by the authority having jurisdiction of the water and sanitary sewer facilities, or unless otherwise specified herein, the Contractor shall disconnect and terminate water and sanitary sewer service lines as follows:

99.3.2.2.3.2.1. Water service shall be discontinued by closing the gate valve or corporation stop at the main and plug the line.

99.3.2.2.3.2.2. Sanitary service shall be discontinued by securely capping or plugging the connection at the main.

99.3.2.2.3.3. **Removal within Proposed Building and Roadway Areas** – in all proposed Buildings and Roadway Areas as shown on the Drawings, existing foundations, floor slabs, and other obstructions shall be removed completely. Backfilling required by the removal of these obstructions shall be performed in the accordance with Section 99.3.4. of these Specifications.

99.3.2.2.3.4. **Removal Outside Proposed Building and Roadway Area** – in all areas outside the proposed Building and Roadway Areas, existing foundations and floor slabs shall be removed to a minimum depth of three (3) feet below finished grade. Foundation slabs that remain in place below the three (3) foot mark shall have twelve (12) inch square openings, ten (10) feet on center, broken out completely, and these openings shall be backfilled with granular material.

99.3.2.2.3.5. **Backfilling Existing Basement Areas** – the Contractor shall exercise extreme care in the backfilling of existing building basement areas, using only clean earth fill placed in layers in accordance with procedures specified under Section 99.3.4 of these Specifications.

99.3.2.2.3.6. **Portions of Pavements, Curbs, etc., to Remain** – in removing portions of pavements, curbs, SIDEWALKS, DRIVEWAYS, and similar items where other portions of such items are to remain, removal shall be to an existing joint, except as otherwise required for restoration over trenching, as specified in Section 99.3.5.2.11.2. Where this is not practical, removal shall be to a reasonably true line with vertical face, which shall be cut with a power driven concrete saw or by other approved mechanical line cutting methods.

99.3.2.2.3.7. **Existing Services to be Maintained** – in removing manholes, catch basins and inlets, all existing live storm drains or sanitary sewers connected to the structure shall be rebuilt and properly reconnected, with service maintained during such construction operations.

99.3.2.2.3.8. **Removal of Underground Storage Tanks** – in removing underground storage tanks, the Contractor shall take all necessary measures to insure that any contents of such tanks have been removed prior to removal of the storage tanks themselves. The Contractor will be held responsible for any damages occurring as a result of spillage of the contents of any ruptured underground storage tanks. All federal, state and local guidelines and requirements shall be followed including of require permits.

99.3.2.2.3.9. **Disposal of Material** – all waste material obtained from the removal of structures and obstructions, including, but not limited to, concrete matted together by reinforcing, plaster, wood, paper, asphalt, shingles, tanks, metal and miscellaneous debris, shall be disposed of off site. Broken concrete (but not including broken concrete matted together by reinforcing), broken pavements, brick

and concrete block not exceeding three (3) cubic feet in volume, may be deposited in the heavy on site fill areas, where and as approved by the ENGINEER. Large rocks and boulders shall be deposited and covered within embankment areas specifically designated by the ENGINEER. Location of on site disposal areas and method of handling and placing such materials shall be subject to the approval of the ENGINEER.

99.3.2.2.4. **Protection of existing Structures and UTILITIES**

99.3.2.2.4.1. **General Requirements** – the Contractor shall be responsible throughout the course of the Work for protection from injury or damage of all existing structures and UTILITIES, which are to remain.

All existing gas and water lines, utilities poles, wires, conduits, sewers, drains, culverts, fire hydrants and other UTILITIES which are to remain shall be carefully supported, maintained in operation and protected from injury or damage by the Contractor.

The Contractor shall support and secure in place all pipe or conduits, without damage thereto. The Contractor shall provide for and maintain, by means of suitable temporary channels or pipe, the flow of drainage and watercourses, whether on the surface or underground, which may be interrupted during the progress of the Work. All drainage lines intercepted or disconnected, shall be restored and/or rebuilt to the extent made necessary by the new Work, and all temporary material required for such construction shall immediately be removed therefrom when no longer required.

99.3.2.2.4.2. **Dead-end Pipe and/or Conduit to be Sealed** – when pipe, conduits or sewers are removed from trenches, leaving dead-ends in the ground, the Contractor shall carefully plug or bulk head such ends with brick and mortar, or in such a manner as met be satisfactory to the ENGINEER or representatives of the UTILITY owner.

99.3.2.2.5. **Protection of existing Landscaping and Natural Features**

99.3.2.2.5.1. **General requirements** – the Contractor shall protect, throughout the course of construction, all such trees as are shown on the Drawings or marked by the ENGINEER. The Contractor shall also protect throughout the course of construction all landscaping, vegetation and natural features on public and private property. The Contractor shall use every precaution to prevent injury, damage, pollution, erosion or destruction of existing landscaping, vegetation

and natural features, including, but not limited to, drainways, ponds, lakes, swamps, woods and fields.

99.3.2.2.5.2. **Protective Fencing Around Trees** – The Township may request the Contractor construct and maintain a proper and substantial protective fence around each such tree that is to be saved. The fence shall be constructed of wood and shall be at least five (5) feet high with minimum 4” x 4” posts and 2” x 4” rails. Minimum clearance shall be ten (10) feet around each tree or as otherwise specified. All protective fencing shall be subject to the approval of the ENGINEER and removed after the completion of the Project.

99.3.2.2.5.3. **Grading and/or Filling Around** – grading and/or filling operations within the protective fencing shall be carried on with extreme care only under the direct supervision of the ENGINEER. If the soil over the root area of the tree has been compacted, it shall be restored by proper cultivation to permit entrance of water and proper aeration of roots.

99.3.2.2.5.4. **Cutting of Tree Roots and Limbs** – roots and limbs of trees are not to be cut unless authorized by the ENGINEER. Should it be necessary to do so, the Contractor shall treat the remaining exposed portion of roots and/or limbs to prevent damage, loss or injury to the tree. This treatment shall be performed in accordance with accepted horticultural practice and by personnel experienced in that field of work.

99.3.2.2.5.5. **Tree Wells** – where designated by the Drawings, the Contractor shall construct tree wells around trees, in accordance with the Details shown on the Drawings.

99.3.2.2.6. **Maintenance and Protection of Traffic**

99.3.2.2.6.1. **General Requirements** – the Contractor shall maintain traffic as required during the course of construction in such a manner satisfactory to the ENGINEER and authorities having jurisdiction. The Contractor shall comply with all rules and regulations of those governing bodies having jurisdiction on the adjacent roadways, and shall obtain required permits and pay all fees, deposits and charges in connection with the same.

99.3.2.2.6.2. **Along STREETS and Highways** – all work in and adjacent to existing highways, STREETS and DRIVEWAYS shall be conducted during appropriate hours as necessitated by the project and approved by the TOWNSHIP MANAGER, and shall be in conformance with PennDOT Publication 203, work Zone Traffic

control. Specific attention is directed to Figures 18, 24 and 25 or the most current standards.

99.3.2.2.6.3. **Conduct of Work** – the Contractor shall furnish, install and maintain construction signs, lights, flares, fences, barricades, steel plates, and/or all other protective devices necessary and required to adequately maintain both vehicular and pedestrian traffic during construction. The Contractor shall provide all personnel necessary for directing and controlling traffic. The Contractor shall provide and maintain adequate barricades to protect the public, TOWNSHIP and other contractors from the Contractor's operations. Traffic entering and exiting the site shall be regulated and maintained so as not to disrupt the normal flow of highway traffic. Emergency personnel and equipment shall have safe and adequate access at all times on site.

99.3.2.2.7. **Mud Control** – the Contractor shall maintain the work area and access roadways free of mud, and take all necessary measures to prevent the accumulation and tacking of mud. The wheels of vehicles shall be cleaned so that no mud is carried onto walks, drives, STREETS or roads. See 99.3.4.2.7. for Dust Control requirements.

99.3.2.2.8. **Construction and Maintenance of Access Roads, Construction Roads and Staging Areas**

99.3.2.2.9. **General Requirements** – If specified in the Project Specifications, or necessary for the Contractor's operation, the Contractor shall construct and maintain suitable gravel or hard surfaced access roads from the existing highway pavement at the proposed driveway to the Project Office and Staging Areas. In addition, similar surfaced areas shall be provided for the employee parking and the area adjacent to the Project Office. The Road and Staging Areas shall be constructed and kept in such condition that vehicles of all other authorized personnel can use them at all times without difficulty. No construction vehicles, vehicles of construction employees, equipment, materials, or supplies shall encroach onto a STREET.

99.3.2.2.10. The Contractor shall be responsible for the installation and maintenance of temporary facilities such as steel plates, ramps, etc., to insure safe, adequate and uninterrupted means of traffic over the roadways. The Contractor shall maintain all roads and STREETS adjacent to the site in a manner satisfactory to the Agency having jurisdiction over those roads and STREETS. This shall include, but not be limited to manual sweeping, power sweeping and/or high pressure washing to prevent tracking of dust and mud onto the public highways and STREETS.

**99.3.3. Soil Erosion and Water Pollution Control****99.3.3.1. Description**

99.3.3.1.1. **Scope** – work under this Section of the Specification shall consist of providing all temporary and permanent control measures as shown on the Drawings and/or as ordered by the ENGINEER or regulatory agency during the life of the CONTRACT to control erosion and water pollution. An approved soil and erosion plan by Allegheny County Conservation District shall be required.

99.3.3.1.2. **Coordination with Permanent Control of Features** – the temporary control provisions contained herein shall be coordinate with the permanent erosion control features to the extent practical to assure economical, effective and continuous erosion throughout the construction and post-construction period.

**99.3.3.1.3. Compliance with Regulations**

99.3.3.1.3.1. The TOWNSHIP will obtain any required DEP Earth Disturbance Permits. The Contractor shall comply with applicable regulations of fish, wildlife and other agencies and all applicable, Federal, State and Local statutes relating to the prevention and abatement of soil erosion and water pollution.

99.3.3.1.3.2. Special attention is called to the requirements of the County Soil Conservation Service and any Permits as issued by the Pennsylvania Department of Environmental Protection as well as its “Soil Erosion and Sedimentation Control Manual”. All earthwork shall be in strict conformance with the Pennsylvania Department of Environmental Regulations, specifically Chapter 102, Erosion Control and NPDES permits shall be followed.

99.3.3.1.3.3. Whenever excavation, relocation, channel cleaning or similar operation, which may either directly or indirectly, affect fish life in any pools, lakes, streams, or reservoirs are necessitated, requires or contemplated to complete the CONTRACT work, the Contractor shall give the Pennsylvania Fish Commission sufficient advance notice thereof to enable transfer of such fish life to be made, or other protective measures taken before work is started.

The Contractor shall not proceed with such work until clearance to do so has been given by the Pennsylvania Fish Commission.

99.3.3.1.3.4. The Contractor shall be responsible for the compliance with all Federal, State, County and Local governmental rules,

regulations, laws and ordinances regarding the use of outdoor fires and the emission of air population materials.

99.3.3.1.3.5. In the event of a conflict between the regulations, the strictest regulation shall govern.

99.3.3.1.3.6. The ENGINEER may arrange field Soil Erosion and Water Pollution control measures which shall at all times be satisfactory to the ENGINEER. When a violation occurs and is not promptly corrected, the ENGINEER may suspend the payments to the Contractor.

#### 99.3.3.2. **Construction Details**

##### 99.3.3.2.1. **Schedule of Work**

99.3.3.2.1.1. **Contractor to Submit Erosion Control Schedule** – prior to the start of the construction, the Contractor shall submit to the TOWNSHIP ENGINEER a program and schedule for accomplishment of temporary and permanent erosion control work applicable during all phases of construction, and a plan for disposal of waste materials. Where erosion is likely to be a problem, clearing and grubbing operations shall be scheduled so that grading operations and permanent erosion control features can follow immediately thereafter, if the Project conditions permit; otherwise temporary erosion control measures may be required between successive construction stages. No work shall be started until the erosion control schedule and methods of operation have been accepted by the ENGINEER and/or the regulatory agency.

99.3.3.2.1.2. **Temporary Erosion Control Measures** – temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but which are not associated with permanent control features on the Project. All slopes and stockpile areas which will remain undisturbed and/or not topsoil and seeded for a period of thirty (30) days shall be temporarily seeded with annual rye grass.

99.3.3.2.1.3. **Permanent Erosion Control Measures** – the Contractor shall incorporate all permanent erosion control features into the Project at the earliest practical time as outlined in the accepted schedule. Slopes shall be seeded as each ten (10) foot incremental height is satisfactorily completed.

99.3.3.2.1.4. **Finalization** – the Contractor shall maintain the control measures in an effective condition until the grading work is complete and an effective stand of grass, as determined by the ENGINEER is achieved. Upon such approval, the Contractor shall remove all temporary erosion control measures not deemed necessary for the General Construction. Upon completion of the Project, the Contractor shall remove all remaining temporary erosion control facilities.

99.3.3.2.1.5. **General Requirements** – all Contractors shall conduct their operations to minimize erosion of soils and to prevent silting and muddying of streams, rivers, irrigation systems, impoundments (lakes, reservoirs, etc.) and lands adjacent to or affected by the Work. Construction of drainage facilities and performance of other CONTRACT work which will contribute to the control of erosion and sedimentation shall be carried out in conjunction with the earthwork operations or as soon thereafter as practical. The area of bare soil exposed at any one time by construction operations shall be kept to a minimum.

99.3.3.2.1.6. **Waterways** – all waterways shall be cleared, as soon as practical, of formwork, sheeting, debris or other obstructions placed during construction operations and which are not a part of the completed work. Drainage ditches which are filled, damaged or made partly inoperative by any Contractor shall be cleaned and made operative before that Contractor stops work for any day, and shall be maintained in a condition satisfactory to the ENGINEER for the duration of the Contractor's operation in that area. The Contractor shall use all care possible to prevent siltation and other pollution of the stream during and after construction. No soil, brush, trees or other debris shall be dumped into the stream or placed upon the bank where it may wash or slide into the stream. Any cofferdams or other earthen structures used to control the stream during construction shall be removed as soon as possible after the work in the stream is completed, and shall not be allowed to wash downstream. The use of equipment in the stream shall be restricted to the very minimum required to complete the work. Upon completion of the work the streambed shall be returned, as near as possible, to its original condition and the banks shall be seeded or planted to prevent erosion.

99.3.3.2.2. **Sediment and Pollutants** – water from operations containing sediment shall be treated by filtration, settling basins or other approved means sufficient to reduce the sediment content to no more than that of the stream into which it is discharged. Pollutants such as fuels, lubricants, bitumen, raw sewage and other harmful materials shall not be discharged into or near rivers, streams, and impoundments or into natural or manmade

channels leading thereto. Wash water or waste from concrete mixing operations shall not be allowed to enter live streams.

99.3.3.2.3. **Area of Work**

99.3.3.2.3.1. The ENGINEER shall have the authority to increase or decrease the surface area of erodible earth material exposed by clearing and grubbing, and/or excavation and fill operations, and to direct the Contractor to provide immediate, permanent, or temporary pollution control measures to prevent contamination of adjacent streams or other water courses, lakes, ponds, or other areas of water impoundment.

99.3.3.2.3.2. In general, the limits of the area of clearing and grubbing and/or excavation and fill operations in progress, shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding and other such permanent control measures current and in accordance with the accepted schedule. Should seasonable limitations make coordination unrealistic, temporary erosion control measures shall immediately be provided by the Contractor.

99.3.3.2.4. **Specific Requirements**

99.3.3.2.4.1. Localized and general erosion control shall be by use of staked straw bales and/or filter fabric. All such installations shall have adequate detention capabilities for collection of sediment. They shall be cleaned of sediment when detention capacity is reduced by twenty-five (25) percent.

99.3.3.2.4.2. All areas disturbed during the grading operations shall receive a soil supplement and be seeded in conformance with Section 804 of PENNDOT Publication 408 using seed Formula E (Rye grass, Annual {Lolium multiforum}) or current edition.

99.3.3.2.4.3. Within forty-eight (48) hours after seeding, seeded areas shall be mulched in conformance with Section 805 of PENNDOT Publication 408 or current edition.

99.3.3.2.4.4. Completed areas, which are later disturbed by the Contractor, shall be immediately repaired by the Contractor in conformance with this Specification.

99.3.3.2.4.5. After a storm event all soil and erosion control measures shall be inspected and reinstalled if necessary.

**99.3.3.3. Materials****99.3.3.3.1. Geotextiles**

99.3.3.3.1.1. Geotextiles used in erosion control shall conform to the requirements of the current NPDES and/or current PENNDOT standards.

**99.3.3.3.2. Dry Rip-Rap**

99.3.3.3.2.1. This item shall consist of furnishing and placing angular shaped stones to provide a protective covering of erosion-resistant material at the locations and in accordance with the details on the Drawings. The stones shall be hard and angular in shape, resistant to weathering and reasonably free from soil, shale and organic materials. All rip-rap material shall conform to Section 850 of PennDOT Publication 408 for the class specified. No more than ten (10) percent of the stone shall exhibit a ratio of maximum to minimum dimension greater than three (3) and in addition, the composition shall contain a sufficient amount of stone smaller than the average stone size to fill the spaces between the larger stones.

99.3.3.3.2.2. Excavation for placing of the dry rip-rap shall be to the required depth and section as shown in the approved Details on the Drawings. The stone shall be placed in the excavated area to produce an even distribution of pieces with a minimum of voids and so that the weight of the stone is carried by the underlying material and not by the adjacent stone. The surface of the dry rip-rap shall be graded to conform to the cross-section shown on the Drawings. The stone shall be placed to its full thickness as one operation, and in such a manner as to avoid displacing the underlying materials. If the underlying materials have been displaced they must be removed and replaced.

99.3.3.3.2.3. Class 2 Geotextiles conforming to Section 735 of PENNDOT Publication 408 or current edition shall be installed in conformance with the CONTRACT plans.

**99.3.3.3.3. Grouted Rip-Rap**

99.3.3.3.3.1. Grouted rip-rap shall consist of providing stones in accordance with Section 99.3.3.3.2., Dry Rip-Rap, but with all spaces between the stones filled with pre-mixed cement grout. All materials of grouted rip-rap shall meet the requirements of those indicated for Dry Rip-Rap. The grout shall consist of one (1) part cement conforming to the requirements of AASHTO Designation 85,

Type 1A, and three (3) parts fine aggregate, conforming to AASHTO Designation M-6.

99.3.3.3.2. The procedure for placing grouted rip-rap shall conform to that for placing Dry Rip-Rap except the space between the stones shall be filled with grout rather than thin spalls. After placement of the stones in accordance with that indicated for Dry Rip-Rap the spaces between them shall be completely filled with grout and the surface of the stones cleaned to remove any accumulation thereof. The rip-rap shall not be grouted in freezing weather. It shall be kept moist for seven days after grouting.

99.3.3.3.4. **Basis of Payment**—unless specifically detailed in the Project Specifications and provided for as a unit in the Proposal Form, all erosion and water pollution control shall be included in the various Unit Prices or Lump Sum bid for the Project.

#### 99.3.4. **Excavation and Embankment**

##### 99.3.4.1. **Description**

##### 99.3.4.1.1. **Scope**

99.3.4.1.1.1. Work under this section of the Specifications shall consist of providing all labor, plant, materials, and equipment to do all excavation, placement, compaction and/or disposal of all material necessary and required to complete the Work in accordance with the CONTRACT Documents. This shall include, but not be limited to:

99.3.4.1.1.1.1. Construction of drainage channels and/or interceptor drainage ditches, also construction and maintenance of all erosion Control facilities

99.3.4.1.1.1.2. Removal of existing topsoil material, stockpiling and spreading stockpiled topsoil, and disposal of excess topsoil material, also, furnished topsoil from off site sources if required

99.3.4.1.1.1.3. Dust and mud control

99.3.4.1.1.1.4. Excavation and/or filling, compaction, and grading to subgrade surface elevations of floor slabs of the proposed buildings and proposed pavements

99.3.4.1.1.1.5. Excavate slopes adjacent to ant building highwalls and provide a foundation wall backfill stockpile, if required

99.3.4.1.1.1.6. Excavation, including disposal of unsuitable and/or surplus material

99.3.4.1.1.1.7. Formation of fill sections, complete with bench grading and sub drains as required, and including embankments and subgrade, using suitable on site excavated material and/or off site borrow material as required

99.3.4.1.1.1.8. Compaction of fill sections and embankments

99.3.4.1.1.1.9. Grading and regrading, including proof rolling of subgrade surfaces

99.3.4.1.1.1.10. Coordinate all work with the other Contractors and UTILITY Companies.

99.3.4.1.2. **Work Specified Under Other Sections** – the following related Work is specified under other Sections:

99.3.4.1.2.1. Soil erosion and water pollution control

99.3.4.1.2.2. Site preparation

99.3.4.1.2.3. Trench excavation and backfill

99.3.4.1.2.4. Storm drainage

99.3.4.1.2.5. Pavements

99.3.4.1.2.6. Maintenance and protection of traffic.

99.3.4.1.3. **Topographic Information**

99.3.4.1.3.1. Topographic information as shown on the Drawings is the basis for the Engineering Design. It shall be the obligation of the Contractor to satisfy himself by personal examination of the site that the existing topography shown is accurate. No claim for extra compensation for inaccuracies of existing topography will be allowed.

99.3.4.1.3.2. The ENGINEER's cross-sections may be furnished to the bidder for their convenience only. The bidders shall make their independent investigations and calculations of quantities.

99.3.4.1.4. **Subsurface Information**

99.3.4.1.4.1. **Existing Subsurface Data** – where subsurface investigations have been performed at the site, the location of each exploration and the information obtained is shown on boring logs and Drawings. Core samples shall be made available.

99.3.4.1.4.2. **Boring and/or Test Pits by Contractor** – permission may be granted, upon request, to drill borings or test pits for the purpose of verifying conditions at the site. The locations and size of such exploratory holes will be subject to approval by the TOWNSHIP and the cost of such explorations shall be borne by the Contractor.

99.3.4.1.4.3. **Examination of Site and Interpretation of Data** – the Contractor shall examine the site as well as all available information and then decide for themselves the character of materials to be encountered. Attention is directed to the fact that subsurface conditions at other than the boring locations may include different soils, hard or soft strata, obstructions that may be either natural or manmade, or other conditions different from those shown in the borings. The boring logs make no representations or absence of such different conditions or as to their nature and extent. The CONTRACT Price should reflect the influence of such features, and it shall be deemed to include all consideration for the risks involved.

99.3.4.1.4.4. **Groundwater Information** – attention is also directed to the fact that the groundwater levels shown in boring logs were measured during or shortly after drilling. The groundwater may rise during wet weather or fall during dry weather. The bidder is hereby advised that varying groundwater levels are to be expected and that this may affect any construction operations involving earthwork.

99.3.4.1.4.5. **Boring Information Not Guaranteed** – neither the ENGINEER, soils Engineer nor the TOWNSHIP guarantees that materials disclosed by the borings will actually be encountered. The data is supplied only for general information and is not guaranteed. The subsurface information referred to herein is made available to the Contractor in good faith and so that they may have access to the same information utilized for design and estimating purposes, and is not intended as a substitute for personal investigation, interpretations and judgements of the bidder.

99.3.4.1.4.6. **Contractor to Accept Actual Site Conditions** – submission of a proposal binds the Contractor to accept the actual site condition and to provide a completed project at no additional cost to the TOWNSHIP, except as specifically provided herein.

99.3.4.1.5. **Quality Control** – all earthwork operations shall be carried out under the direct control of the ENGINEER, and/or the Soils ENGINEER. The Soils ENGINEER will have technical personnel on the site during the earthwork operations, who will conduct as many tests as they feel necessary to insure proper control of the moisture, density, compaction and other qualities of Work. The Contractor shall abide by the results of such tests and the recommendations of the Soils ENGINEER in the full conduct of the Work and in the correction of conditions which are unsatisfactory and not in accordance with the Drawings and Specifications. Work will not be accepted by the TOWNSHIP until certified by the Soils ENGINEER to be in compliance with the Drawings and Specifications.

99.3.4.2. **Construction Details**

99.3.4.2.1. **General**

99.3.4.2.1.1 The Contractor shall remove all soil, rock and other material and utilize or dispose of these materials as shown on the Drawings and as specified herein, at an approved site. See §99.3.4.2.9.

99.3.4.2.1.2. The Contractor shall carry out excavation and embankment to the subgrade surface elevations which conform with the finished grades as shown on the Drawings, as determined by the thickness of pavements, depths of topsoil required, etc. In building areas, Work shall be carried to subgrade elevations as determined by thickness of floor slabs and pavement thickness, as indicated on the CONTRACT Drawings or the Architectural Drawings.

99.3.4.2.1.3. Where specified, the Contractor shall construct a temporary two (2) horizontal to one (1) vertical slope for construction of Buildings where the “upper level” of the perimeter area is adjacent to the Building. A five (5) foot wide level area extending from the proposed building walls to the bottom (toe) of the slope shall be provided by the Contractor.

99.3.4.2.1.4. **Rock excavation Under Building Site** – all rock as herein defined shall be removed from under the Building site to an approved subgrade level and shall extend as required for the proposed design of the building. The excavated rock shall be

disposed of as embankment elsewhere on the site as herein provided or as per Section 99.3.4.2.9. The excavated area shall be replaced with approved materials in conformance with the embankment requirements.

99.3.4.2.1.5. The Contractor shall be responsible at all times for carrying out all excavation and embankment operations in a safe and prudent manner so that all persons and property will be protected for hazard. The Contractor shall comply with all applicable safety and protection laws, rules and regulations of all Federal, State, and Local Agencies having jurisdiction.

99.3.4.2.1.6. The Contractor shall prepare and submit to the ENGINEER for approval his construction schedule for stripping, excavation, embankment and fill operations. The Schedule must include the sequence of the Work, and must provide for the construction of permanent erosion control work at the earliest possible time.

99.3.4.2.2. **Detention Pond and/or Soil Erosion and Water Pollution Control Maintenance and Modifications**

99.3.4.2.2.1. **General Requirements**—where required by Drawings, the Contractor shall construct or modify the detention pond/ or ponds to the size, shape and depth shown on the approved Drawings.

99.3.4.2.2.2. **Contractor to Submit Construction Schedule**—prior to the start of construction, the Contractor shall submit to the ENGINEER his schedule and procedure for construction, maintenance, or modification of the detention ponds, which shall be formulated in conjunction with the schedule for “Soil Erosion and Water Pollution Control”. No work shall be started until this schedule and procedure has been accepted by the ENGINEER, and once accepted, they shall be strictly adhered to by the Contractor, and no revisions shall be made unless approved by the ENGINEER.

99.3.4.2.2.3. **Pond Construction** – the bottom and side slopes of the pond shall be graded to conform to the finished grade as shown on the approved Drawings.

99.3.4.2.2.4. **Protection and Erosion Control** – upon completion of pond construction, the Contractor shall place all required rip-rap, energy dissipaters, etc. The embankment and bottom of the pond shall be immediately top soiled and grasses in accordance with the

methods for turf establishment under the applicable Section of these Specifications.

99.3.4.2.2.5. **Maintenance** – All detention ponds must be maintained to function according to the approved plan, said ponds should be inspected after storm events, to ensure they are functioning properly.

99.3.4.2.3. **Drainage During Construction**

99.3.4.2.3.1. During grading operations, pits, cuts, excavation areas and/or embankments and subgrades shall be shaped, sloped and maintained to facilitate drainage of surface waters. Existing drainage routes shall not be choked or obstructed until new ones are available. Temporary culverts, pumps or other equipment shall be used to facilitate drainage or fills during construction.

99.3.4.2.3.2. Care must be exercised in the control plan so as to avoid discharge of surface flows across watershed lines.

99.3.4.2.4. **Drainage Interceptor Ditches**

99.3.4.2.4.1. **General Requirements** – the Grading Contractor shall excavate and maintain until final acceptance all drainage interceptor ditches shown on the Drawings. Such ditches shall be located as shown and shall provide positive flow in the direction noted. In the existing topography should vary from that shown in the Drawings, the Contractor shall notify the ENGINEER, who shall designate what adjustments to the interceptor ditches shall be made.

99.3.4.2.4.2. **Contractor to Submit Construction Schedule** – prior to the start of construction the Contractor shall submit to the ENGINEER his schedule and procedure for construction of draining ditches, which shall be formulated in conjunction with the construction schedule for “Soil Erosion and Water Pollution Control”. No Work shall be started until this schedule and procedure has been accepted by the ENGINEER, and once accepted, they shall be strictly adhered to by the Contractor. No revisions shall be made unless approved by the ENGINEER.

99.3.4.2.4.3. **Protection and Erosion Control** – all drainage interceptor ditches shall be top soiled and grassed in accordance with the methods for turf establishment under the applicable Section of these Specifications.

99.3.4.2.4.4. Any drainage interceptor ditches which are not part of the permanent erosion control and drainage plan will be removed or back filled by the Contractor as the storm sewer system is installed.

99.3.4.2.5. **Channel Construction**

99.3.4.2.5.1. **General Requirements** – where required by the Drawings, the Contractor shall construct open channels in accordance with the alignment, grade and section shown on the Drawings.

99.3.4.2.5.2. **Contractor to Submit Construction Schedule** – prior to the start of construction, the Contractor shall submit to the ENGINEER his schedule and procedure for construction of channels, which shall be formulated in conjunction with the construction schedule for “Soil Erosion and Water Pollution Control”. No Work shall be started until this schedule and procedure has been accepted by the ENGINEER, and once accepted, they shall be strictly adhered to by the Contractor and both revisions shall be made unless approved by the ENGINEER.

99.3.4.2.5.3. **Protection and Erosion Control** – upon completion of channel grading operations, the Contractor shall place all rip-rap and/or paving as required by the Drawings. In all other areas the channel shall be top soiled and grassed in accordance with the methods for turf establishment under the applicable Section of these Specifications.

99.3.4.2.5.4. **Diversion of Existing Watercourse** – no existing watercourse shall be diverted until the new channel is constructed and its embankment and bottom stabilized with permanent erosion control measures such as rip-rap, paving, grasses, etc.

99.3.4.2.5.5. Any channels which are not part of the permanent erosion control and drainage plan shall be removed or back filled by the Contractor as the storm sewer system is installed.

99.3.4.2.6. **Storm Sewer Installations**

99.3.4.2.6.1. The Contractor shall install certain portions of the storm sewer system during his initial phases of the grading work to serve as part of storm water management and erosion control plan. These sewers which must be installed immediately by the Contractor are detailed on the Grading and/or the Erosion Control Plans.

99.3.4.2.6.2. The storm sewers specified to be installed by the Grading Contractor may be incorporated into, and become part of the permanent site drainage system. The grading Contractor shall protect the storm sewers from abrasive scour by constructing and maintaining siltation ponds and filters at the pipe inlets.

99.3.4.2.6.3. **Subgrade Drains** – where damaging subsurface water is encountered, subgrade drains shall be installed as directed by the ENGINEER and extended to an inlet or other outlet as specified. Drains shall comply with the requirements of Section 99.3.6.2.12. Payment will be made only when such drains are included as an item on the Proposal Form.

99.3.4.2.6.4. All storm sewer materials, trench excavation and backfill, and methods of construction shall be in conformance with the applicable sections of Sections 5 and 6 of this Specifications.

99.3.4.2.7. **Dust Control** - See §99.3.2.2.7. regarding Mud Control for additional requirements.

99.3.4.2.7.1. **General Requirements** – throughout all operations covered by this Section, the Contractor shall provide all necessary measures to control dust through the use of water, calcium chloride, or other material approved by the ENGINEER, at such locations and during such periods as he may direct, or as may be required by local Ordinance or Authorities.

99.3.4.2.7.2. **Spreading Calcium Chloride** – calcium chloride shall be spread in pellet or flake form by approved devices so that uniform distribution is attained over the entire area being treated.

99.3.4.2.7.3. **Applying Water** – watering equipment shall consist of pipelines, tanks, tank trucks, or other approved devices capable of applying a uniform spread of water over the surface. A suitable device for regulating the flow and positive shutoff of the water shall be provided for positive control by the operator.

99.3.4.2.7.4. **Authority of ENGINEER**—the ENGINEER will advise the Contractor of any unsatisfactory procedures for dust control. If the unsatisfactory procedures are not corrected promptly, the ENGINEER may suspend the performance of any or all construction until the condition has been corrected.

**99.3.4.2.8. Excavation**

99.3.4.2.8.1. **General Requirements** – the Contractor shall be responsible for all excavation of whatever material encountered, and, with the exception of “Rock Excavation” and “Undercut excavation” as hereinafter described, there will be no extra compensation for any excavation, regardless of the nature of the subsoil. The Contractor shall be responsible for the disposal off site of all surplus excavated material. Prior to commencement of excavation, the Contractor shall advise the ENGINEER of the quantity of surplus material, if any, he estimates will be disposed of off site. In the event the Contractor disposes of too much excavated material, he shall replace this material as necessary and required, at his own cost and expense. Material to be replaced shall meet the requirements for fill material as specified herein and shall be subject to the approval of the Soils ENGINEER.

99.3.4.2.8.2. **Classification** – all material excavated shall be classified as “Topsoil Excavation”, “Rock Excavation”, or “Earth Excavation” and each of these materials shall be further classified as “Suitable Materials” or “Unsuitable Material as follows:

99.3.4.2.8.2.1. **Topsoil Excavation** – topsoil excavation shall be defined as removal of the existing surface layer of organic material, which is suitable for reuse in seeding, sodding and planting. Topsoil shall contain no admixture of refuse or substances harmful to plant growth, and shall be free from subsoil, stumps, roots, brush, stones, clay lumps or similar objects.

99.3.4.2.8.2.2. **Rock Excavation** – rock excavation shall be defined as removal of rock that is present in definite ledge formation, and which requires blasting or special excavation methods and equipment for removal. Rock excavation shall also include removal of boulders more than one (1) cubic yard in volume. Rock excavation shall not include removal of loose or previously blasted rock in rock fills or elsewhere, or removal of rock beyond the maximum pay limits, as specified herein and indicated on the Drawings. Materials, which can normally be excavated by means of bulldozers, such as “CAT D9H” or equivalent, with hydraulic attachment having a single tooth, will be considered as earth excavation and not rock excavation.

99.3.4.2.8.2.3. **Earth Excavation** – earth excavation shall be defined as removal of all material not specifically defined

herein as “Topsoil Excavation” or “Rock Excavation”, and shall included, but not be limited to, muck, hardpan, soft shale and loose, disintegrated or decomposed edge rock which can be removed by utilizing a “CAT D9H” or equivalent with ripper tooth or equivalent.

99.3.4.2.8.2.4. **Suitable Material** – suitable material shall be defined as material whose composition is satisfactory for use in embankment construction. In general, any mineral (inorganic) soil, blasted or broken rock, and similar materials of natural or man-made origin, including mixtures thereof, shall be considered suitable material.

99.3.4.2.8.2.5. **Unsuitable Material** – unsuitable material shall be defined as any material containing vegetation or organic matter, such as muck, peat, organic silt, topsoil or sod, that is not satisfactory for use in embankment construction or for support of permanent structures. Certain manmade deposits such as landfill material may also be determined to be unsuitable material. Unsuitable material shall be excavated to its full depth and backfilled with suitable compacted material as approved by the Soil ENGINEER. Geotextiles may be considered for use in the stabilization of unsuitable materials after presentation of the design is approved by the Soils ENGINEER. Classification of all materials into the above five classifications will be made by the TOWNSHIP’s consulting Soils ENGINEER whose decision shall be final and binding upon the Contractor. Should the Contractor encounter unusual material, he shall immediately notify the Soils ENGINEER, who will examine the material, classify it and advise the Contractor as to the method of handling. Unauthorized removal of material before it has been classified by the Soils ENGINEER is performed at the Contractor’s risk.

99.3.4.2.9. **Disposal of Material Outside the Work Site**

99.3.4.2.9.1. Unless otherwise specified in the Project Specification, the Contractor shall make his own arrangements for disposing the waste and excess materials outside the work site and shall pay all costs incurred therefor.

99.3.4.2.9.2. When any material is to be disposed of outside the work site, the Contractor shall first obtain a written permit from the property owner on whose property the disposal is to be made and he shall file with the Owner said permit or a certified copy thereof,

together with a written release from the property owner, absolving the owner from any and all responsibility in connection with the disposal of material on said property.

99.3.4.2.9.3. Contractor in disposing of waste and excess materials shall comply with all Federal, State and Local governmental rules, regulations, laws, and ordinances concerning such disposal of waste and excess materials.

99.3.4.2.9.4. Unless otherwise provided in the Project Specification, full compensation for all costs involved in disposing of materials as above specified, including all costs of hauling, shall be considered as included in the price paid for the Contract items of work involving such material and no additional compensation will be allowed.

99.3.4.2.10. **Topsoil**

99.3.4.2.10.1. **Definition** – topsoil shall consist of surface soils containing not less than 2.0% nor more than 10.0% organic matter, as determined in accordance with AASHTO designation T194. Topsoil obtained from off-site shall have a quality with proven ability to sustain growth. Topsoil shall be graded and placed in conformance with Section 802 of PENNDOT Publication 408 or current NPDES standards.

99.3.4.2.10.2. **General** – topsoil, where present on the site, shall be stripped and stockpiled by the Contractor in sufficient quantity to insure compliance with the Drawings and Specifications. Topsoil shall not be used for fill or embankment unless specifically authorized by the Soils ENGINEER, and then only in those locations and as specifically approved by the Soils ENGINEER.

99.3.4.2.10.3. **Stripping of Topsoil** – topsoil shall be stripped for its full depth within the entire limits of earthwork including the proposed building areas. Topsoil shall not be stripped beneath the spread of the branches of trees designated “To Be Saved” unless approved otherwise by the ENGINEER. Topsoil stripping shall be completed prior to the start of general excavation in the area.

99.3.4.2.10.4. **Stockpiling of Topsoil** – all topsoil suitable for reuse shall be kept separate from other material, stored and stockpiled on the site in locations approved by the ENGINEER and protected from erosion, to include appropriate Erosion Sedimentation (ES) control methods.

99.3.4.2.10.5. **Deficiency of Topsoil** – if there is not a sufficient quantity of topsoil present on the site, the Contractor shall supply and spread, from off-site source(s), the necessary quantity of topsoil to complete the topsoil operations as specified herein or shown on the Drawings. The Contractor shall protect the topsoil stored on the site, and include appropriate Erosion Sedimentation control methods.

99.3.4.2.10.6. **Spreading of Topsoil** – topsoil shall be spread over the specified areas as soon as grading operations have been completed. The Contractor shall place topsoil to a minimum depth of four (4) inches on all embankments, planting areas, seeded areas, etc., first scarifying the subgrade to a depth of two (2) inches for bonding of the topsoil with the subsoil and cleared of all debris, roots, stones, and otherwise unsatisfactory material. Immediately upon completion of topsoil operations, embankments and all other disturbed areas shall be seeded in accordance with the appropriate Section of the Specifications.

99.3.4.2.11. **Rock Excavation**

99.3.4.2.11.1. **General Requirements** – the Contractor shall excavate, remove and dispose of rock within the limits specified and in accordance with the Drawings and/or Specifications as approved by the ENGINEER. Unless otherwise specified or directed, rock excavation shall be carried to a depth six (6) inches below subgrade surface. The subgrade shall then be brought to a smooth subgrade surface with suitable approved material and compacted to the specified density.

99.3.4.2.11.2. **Shattered Rock** – if, in the course of rock excavation, the rock below grade is shattered due to over drilling or blasting, and the Soils ENGINEER considered such shattered rock to be unfit for support of structures, the shattered rock shall be removed and the excavation backfilled with concrete, screened gravel or crushed stone, as the Soils ENGINEER may approve. All such removal and backfilling shall be performed by and at the expense of the Contractor.

99.3.4.2.11.3. **Slope Preservation** – where rock cuts requiring drilling and blasting will be exposed after the Project is completed, all necessary precautions shall be exercised to preserve the finished rock slope in a natural undamaged condition, with the surface remaining reasonably straight and clean. Blast holes shall be drilled on the inclination of slope along the line of the proposed finished slope and in the adjacent areas. An approved system of blasting shall be employed. The spacing of the blast holes and the method of

blasting required will be dependent upon the quality and the structure of the rock encountered and the method of blasting used in approaching the slope. The Contractor shall adjust his operations to obtain the slope conditions required by the Drawings and/or Project Specifications.

99.3.4.2.11.4. **Blasting** – when blasting is performed, the Contractor shall use proper methods of protection and shall be responsible for all damages due either directly or indirectly to such operations. He shall comply with all State, County and Local regulations and acquire all necessary insurance, permits and licenses. Before any blasting is done or explosives delivered to the site of the work, the Contractor shall show evidence that he and the Owner are protected under the clauses of the Public Liability and Property Damage Insurance policies. The Blaster shall be licensed and submit his pattern and charge proposal to the Soils ENGINEER for review prior to any drilling. Fractures caused by the blasting shall not extend more than three (3) feet below the subgrade or beyond a finished grade surface. Mats conforming to State regulations shall be used during all blasting operations. The Contractor shall furnish the services of an approved geotechnical ENGINEER to monitor and record the transmission of vibrations from the blasting operations. Such monitoring procedures shall be subject to prior approval of the Owner's Soils ENGINEER. Certified copies of all monitoring results shall be submitted to the Owner's Soils ENGINEER.

99.3.4.2.11.5. **Measurement and Payment** – should rock be encountered, such excavation may be considered as "Extra Work", and the Contractor will be paid for "Rock Excavation" as defined in the Project Specifications. When material is encountered which is classified as "Rock" by the Soils ENGINEER, it shall be uncovered by the Contractor who shall, at his own expense, employ a licensed Land Surveyor to obtain proper cross-sections of the rock. These rock cross-sections shall be accurately plotted to scale and certified by a Licensed Land Surveyor. A reproducible set of the certified cross-sections and a copy of the Surveyor's field notes shall be provided to the ENGINEER who will use this data to compute the amount of rock to be excavated. The amount of rock to be excavated will be determined by the ENGINEER using the method of "Average End Areas", with planimeter accuracy. The quantity of rock excavation measured for payment shall be the number of cubic yards of rock excavated as measured in its original position within the payment lines shown on the Drawings, and as specified herein. Payment shall also include satisfactory use and/or disposal of the rock excavation.

**99.3.4.2.12. Subgrade Undercutting**

99.3.4.2.12.1. **General Requirements** – the Soils ENGINEER shall inspect the subgrade surface in area of cut and the embankment foundation in areas of fill to determine if any “Undercut Excavation” is required and the extent of such undercutting. The Contractor shall, upon written authorization of the Soils ENGINEER, excavate, remove, and dispose of any such unsuitable material and replace same with compacted fill material in accordance with these Specifications to proper grade as shown on the Drawings.

99.3.4.2.12.2. **Payment** – No additional payment will be made for such removal and replacement of Unsuitable Material as directed. Payment shall be considered as being included in the Contract Sum.

**99.3.4.2.13. Embankment**

99.3.4.2.13.1. **General Requirements** – all suitable material removed from the excavation, as determined by the Soils ENGINEER, shall be used as directed in the formation of sill sections, embankments and subgrade. The Soils ENGINEER may determine that excavated material from certain strata is unsuitable for use under paved areas and/or building areas but that such material may be deposited in heavy fills or embankments areas outside of paved and/or building areas. The Soils ENGINEER may determine that excavated material from certain areas or certain strata is unsuitable for use on site, and such material shall thus be declared “Unsuitable Material” and be disposed of offsite as herein specified.

99.3.4.2.13.2. **Borrow Material** – the Contractor shall supply any required borrow material from offsite, under the Contract Sum. Requirements for this offsite fill material shall be as specified hereinafter. Fill supplied by the Contractor from an offsite source shall be common fill, free of organic or other deleterious material and capable of supporting construction traffic and being compacted to the densities hereinafter specified. This fill shall meet with the approval of the Soils ENGINEER. The Soils ENGINEER shall also have the opportunity to visit and inspect the proposed borrow area prior to its use. This material shall not be used as a fill until approved by the Soils ENGINEER. Final acceptance of fill material shall rest with the Soils ENGINEER, whose decision shall be final and binding upon the Contractor. The acceptance of any sample material by the Soils ENGINEER shall not relieve the Contractor of the responsibility of having all material used conform to the approved sample.

99.3.4.2.13.3. **Preparation of Embankment Benches** – prior to the placement of any embankment material, the site shall be benched and toe drains installed as specified by the Soils ENGINEER. Less steep surface areas shall be sacrificed. Prior to placing fills, the Contractor shall compact to a depth of one (1) foot, the exposed embankment foundations to the densities hereinafter specified, by rolling or other method approved by the Soils ENGINEER. Equipment employed shall be capable of providing loading up to fifty (50) tons. The cost of such Work shall be included in the Contract Sum.

99.3.4.2.13.4. **Placing Fill** – fill sections and embankments shall be constructed of earth, rock or a mixture of earth and rock, deposited in successive lifts. Except as hereinafter permitted, the loose thickness of each lift shall not be more than eight (8) inches before compaction. The size of rock particles within the fill in building areas and in the upper three (3) feet of paved areas shall not exceed eight (8) inches mean diameter. The maximum size of rock particles below the upper three (3) feet in paved areas may be increased to a maximum of three (3) feet by three (3) feet by 16 inches thick. The large rock shall be individually placed to permit thorough compaction of approved fill material on all sides. In no case may the rocks be placed as a full lift without soil encapsulation. No large rock shall be placed within any building area, defined as the building outline plus a ten (10) foot wide perimeter strip. No large rocks shall be placed within six feet of the inlet or manholes and no large rock shall be placed above storm sewer lines, sanitary sewer lines, water lines or any other utility line. Further, no large rocks shall be placed within six (6) feet horizontally from a proposed utility line or four (4) feet vertically from the grade of a proposed utility line. All large rock must be placed and approved by the Soils ENGINEER. Where fill is to be placed on existing pavement, the Contractor shall scarify, break or remove the pavement prior to placing of the fill as approved by the Soils ENGINEER. When embankments are to be constructed on existing slopes steeper than five (5) horizontal to one (1) vertical the existing slope shall be benched in accordance with the details shown on the Drawings and/ or Specifications as approved by the Soils ENGINEER. In all slope areas the embankment material shall be bladed into the adjacent existing material for a horizontal distance of at least six (6) feet. All methods employed in the placing of embankment on existing slopes shall be subject to the approval of the Soils ENGINEER. Embankments shall be pitched to provide drainage at the close of each day's operations. In no case shall the slope of fill construction exceed a ratio of two (2) horizontal to one (1) vertical unless specifically directed or approved by the Soils ENGINEER.

99.3.4.2.13.5. **Compaction of Fill** – the soil shall be compacted to a density not less than 95% of the maximum dry density as defined by ASTM D-1557, current edition, for that soil. Prior to commencing embankment operation, the Contractor shall supply data on the compaction equipment to be used to the Soils ENGINEER. Prior to compaction, each layer shall be leveled off by the use of blade graders or bulldozers with adequate power for the work involved. The entire area of each layer shall be compacted by distributing equipment, by hauling over the area, by the use of tread type equipment, power rollers weighing not less than ten (10) tons, vibratory compactors or by other mechanical means satisfactory to the Soils ENGINEER. Compaction shall be continued until each layer is thoroughly consolidated for its full width. The use of hauling equipment to obtain partial compaction is acceptable, but compaction to the specified densities for each lift will be required. Construction and hauling equipment shall be routed evenly over the area in order to avoid the creation of ridges, hollows and zones of non-uniform density.

99.3.4.2.13.6. **Frost** – no fill material shall be placed when the fill material, the embankment foundation or the previous lift on which it is to be placed is frozen. In the event that any fill which has already been placed or the embankment foundation shall become frozen before the next lift is placed, it shall be sacrificed and recomputed or removed, to the approval of the Soils ENGINEER. Any soft spots resulting from frost shall be removed or recomputed before new fill material is placed, to the satisfaction of the Soils ENGINEER.

99.3.4.2.13.7. **Moisture** – if, in the opinion of the Soils ENGINEER, fill material becomes too wet for the required compaction, prior to commencing or continuing compaction operations, the fill shall be dried by a method approved by the Soils ENGINEER. If, in the opinion of the Soils ENGINEER, the fill material becomes too dry for the required compaction, the fill shall be moistened prior to commencing or continuing compaction operations, by a method approved by the Soils ENGINEER.

99.3.4.2.13.8. **Protection of Fill** – protection of all compacted lifts shall be responsibility of the Contractor. Damage to any compacted lift, including those lifts previously tested and approved by the Soils ENGINEER, occurring at any time during the course of construction, caused by equipment, from moisture entering the embankment, or from any other cause whatsoever, shall be fully repaired by the Contractor prior to the placement of any overlaying materials, at his own expense and to the complete satisfaction of the Soils ENGINEER. In the event of heavy rains, the Contractor shall

suspend fill operations immediately and shall take all necessary steps to keep the site as well drained as possible. Fill operations shall not be resumed until the moisture content of the fill to be placed is such as to permit compliance with the Specifications. All corrective work or operations necessary to maintain proper moisture control of the fill material shall be at the expense of the Contractor.

99.3.4.2.13.9. **Foundation Wall Backfill Stockpiles** – the grading Contractor may be required to provide a stockpile of suitable material (as determined by the Soils ENGINEER) at the location and in the quantities shown on the Grading Plans. Such material stockpiles shall be protected from erosion. The Buildings Contractor shall be responsible for removing any excess in the stockpile within the yardage specified. Volumes shall be computed on their compacted densities.

99.3.4.2.14. **Proof Rolling of Subgrade Surface**

99.3.4.2.14.1. **General Requirements** – all subgrade surfaces shall be proof-rolled by means of heavy rollers to locate and permit timely correction of subgrade deficiencies which will adversely affect the performance of the pavement structure. Equipment capable of providing a loading of up to fifty (50) tons shall be available as required by the Soils ENGINEER.

99.3.4.2.15. **Pavement and Building Subgrade**

99.3.4.2.15.1. All subgrade surfaces, prior to fine grading for pavement and building construction, shall be graded to within one-tenth (0.1) + foot of the required subgrade surface elevations. This tolerance shall balance, so that the surface can later be fine graded without adding or removing material.

99.3.4.2.15.2. **Cut Sections** – in cut sections, proof-rolling of the subgrade surface shall be performed to determine the location and extent of areas below subgrade surface that may require subgrade undercutting. Should any portion fail to provide satisfactory support for the proof-rolling operation, the Soils ENGINEER may order corrective undercut and backfill be performed. Payment for such corrective work shall be as specified elsewhere herein under “Subgrade Undercutting”.

99.3.4.2.15.3. **Embankment Sections** – in embankment sections, proof-rolling of the subgrade shall be performed to determine the uniformity of the compaction below the subgrade surface and to locate subgrade deficiencies requiring corrective work. Any

deficiencies discovered during proof-rolling operations shall be corrected in a manner satisfactory to the Soils ENGINEER. After all corrective work has been completed, the surface shall be proof-rolled again. Corrective work shall not be considered complete and acceptable until the embankment shows satisfactory and uniform response to the proof-rolling operations. All work necessary and required to correct subgrade deficiencies in embankment sections shall be at the Contractor's expense.

99.3.4.2.15.4. **Drainage** – all building site subgrades shall be temporarily sloped to provide drainage. The sloping shall be such that the cut and fill balance within the building site.

99.3.4.2.16. **Coordination of Operations** – the Contractor is advised that, during the course of work under this Section, work may be processing on other phases of the Project, including work on separate contracts with the Owner for building construction, utilities, etc. It shall be the responsibility of the Contractor to coordinate all his operations and those of any of his Subcontractors with the operations of these other contractors, with the approval of the ENGINEER.

### 99.3.4.3. **Temporary Facilities**

#### 99.3.4.3.1. **Scope and Requirements**

99.3.4.3.1.1. Work under this Section of the Specifications shall consist of providing all labor, equipment and materials necessary and required to provide temporary construction access and utilities for construction. Work shall include, but not be limited to:

99.3.4.3.1.1.1. Construct temporary construction access roads, staging areas, project office areas, and employee parking areas.

99.3.4.3.1.1.2. Maintenance of the above roads and areas.

99.3.4.3.1.2. The Contractor shall construct and maintain his own office site, employee parking area, equipment parking area and equipment maintenance area. The Contractor shall provide his own water, electric and telephone service.

99.3.4.3.1.3. The Contractor shall provide portable sanitary facilities for his employees and also for the Owner's Representatives. The Contractor shall remove his facilities and restore the site upon completion of his operation.

99.3.4.3.1.4. Township approved placement of facilities.

99.3.5. **Trench Excavation and Backfill**

99.3.5.1. **Description**

99.3.5.1.1. **Scope** – work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment necessary and required to properly excavate and backfill all utility systems and subsurface structures installed under this Contract. Work shall include, but not be limited to:

99.3.5.1.1.1. All necessary clearing, grubbing and removal of topsoil

99.3.5.1.1.2. All necessary excavation, including disposal of unsuitable and/or surplus material

99.3.5.1.1.3. Protection of landscaping, utilities and structures

99.3.5.1.1.4. All necessary backfill and compaction, including furnishing additional suitable backfill material as required

99.3.5.1.1.5. Barricades and maintenance of traffic

99.3.5.1.1.6. Sheet piling, shoring and bracing

99.3.5.1.1.7. Dewatering of trenches

99.3.5.1.1.8. Surface Restoration.

99.3.5.1.2. **Work Specified Under Other Sections**

99.3.5.1.2.1. The following related Work if specified under other Sections:

99.3.5.1.2.1.1. Soil Erosion and Water Pollution Control

99.3.5.1.2.1.2. Site Preparation

99.3.5.1.2.1.3. Excavation and Embankment

**99.3.5.1.3. Existing Utilities and Subsurface Structures**

99.3.5.1.3.1. The Contractor is referred to the procedures regarding existing utilities and structures given under other Sections of these Specifications.

99.3.5.1.3.2. The Contractor shall be responsible for the protection of all other utilities in the trench zone. All damage to gas, water, telephone, power, or sewer lines shall be repaired immediately at the Contractor's expense. In no event shall any utility service remain interrupted overnight. Including making appropriate call to PA-one call for arrangement.

**99.3.5.2. Construction Details****99.3.5.2.1. General**

99.3.5.2.1.1. Trench excavation shall be performed by the Contractor to conform with the line and grade of the various utilities and the bottom of the foundations and/or footings for subsurface structures as shown on the Drawings and as specified herein.

99.3.5.2.1.2. All excavations shall be kept free from water, snow, and ice during construction.

99.3.5.2.1.3. The excavation of the trench shall not advance more than 200 feet ahead of the pipe laying and masonry work, except where it is absolutely necessary because of site conditions.

99.3.5.2.1.4. Mats shall be placed for excavation equipment where damage could be caused to existing pavements.

99.3.5.2.1.5. The Contractor shall be responsible at all times for conducting all operations in a safe and prudent manner so that all workmen and the public will be protected from hazard. The Contractor shall observe all applicable local, State and/or Federal requirements.

99.3.5.2.1.6. Any required embankments shall be constructed to a minimum of four (4) feet above the outside top of the conduit prior to beginning the Trench Excavation. Shallow installations with less than four (4) feet of cover over the top of the pipe shall be constructed after all heavy hauling is completed over the pipe location.

99.3.5.2.1.7. **Stream Siltation Prevention** – the Contractor shall use all care possible to prevent siltation and other pollution of streams during and after construction. No spoil, brush, trees or other debris shall be dumped into any stream or placed upon the bank where it may wash or slide into any stream. Any cofferdams or other earthen structures used to control any stream during construction shall be removed as soon as possible after the work in the stream is completed, and shall not be allowed to wash downstream. The use of equipment in any stream shall be restricted to the very minimum required to complete the work. Upon completion of the work the streambed shall be returned as near as possible to its original condition, and the banks shall be rip-rapped, seeded or planted to prevent erosion.

99.3.5.2.1.8. **Soil Erosion and Sedimentation** – the Contractor shall take all measures necessary to prevent soil erosion during the course of the work and restore the site of the work in such a manner that erosion is not possible. The Contractor shall maintain earthen surfaces until vegetation is restored. Regulations and guidelines of the Pennsylvania Department of Environmental Protection and the Allegheny County Soil Conservation District shall be adhered to at all times and all applicable NPDES permit regulations.

99.3.5.2.1.9. **Maintenance and Control of Traffic** – the installation and maintenance of work zone traffic controls shall conform to the requirements of PENNDOT Publication 203 current edition. All signs shall conform to the requirements and standards as set forth in PENNDOT Title 67, Chapter 211, “Official Traffic Control Devices”.

99.3.5.2.1.10. **Landscaping** – adequate protection shall be provided for all lawns, shrubs, trees and other landscape work along line of work. The Contractor shall remove, preserve and replace landscaping and topsoil in the work area.

#### 99.3.5.2.2. **Trench Excavation**

99.3.5.2.2.1. **General Requirements** – the Contractor shall be responsible for the excavation of all materials encountered, with the exception of “Rock Excavation in Trench” and “Additional Trench Excavation” as hereinafter defined. There shall be no extra compensation for any excavation regardless of the character or type of subsoils, except as noted and specifically listed as a bid item on the Proposal Form.

99.3.5.2.2.2. **Method of Training** – trenching shall be performed with excavating equipment except in such places where Work performed in this manner will injure trees, buildings, existing utilities or structures, or where the use of equipment is specifically forbidden, in which case hand methods shall be employed.

99.3.5.2.2.3. **Trench Width** – the trench width shall be confined to the most practical minimum width. The width of the trench as the top of the pipe shall not exceed:

- Less than 15” O.D. Pipe—30”
- 15” to 42” O.D. Pipe—Pipe O.D. plus 24”
- Over 42” O.D. Pipe—Pipe O.D. plus 36”

A tolerance of 12” increase is permitted with the approval of the ENGINEER, but such approval shall not imply approvals for additional compensation.

99.3.5.2.2.4. **Preparation of Bottom of Trench** – the bottom of the trenches shall be prepared to conform to the grade of the pipe and the bottom of the foundation of structures. The bottom of trenches shall be shaped as shown on the details of the Drawings. Special precautions shall be exercised to insure that pipes, when installed, will not rest on rock, masonry or any other materials, which would present a non-uniform foundation. Where two or more pipes are to be laid in the same trench, the Contractor will excavate the trench so that all pipes are laid in conformance with the specified pipe bedding, or better. See 99.3.5.2.6.

99.3.5.2.2.5. **Unsuitable Material at Bottom of Trench** – when the material at the bottom of a trench is unsuitable, as determined by the ENGINEER, it shall be removed to such a depth as the ENGINEER may direct, and backfilled with suitable granular material obtained from the project excavation, graded aggregate of from borrow excavation if it is not available within the project. Payment for removal and replacement of this unsuitable material shall be made under the Unit Price for “Additional Trench Excavation”, as herein defined.

99.3.5.2.2.6. **Excavation Below Required Grade** – excavation below the grade of pipes or subsurface structure shown on the Drawings, necessitated by changes in grades in accordance with the directions of the ENGINEER, will be paid for under “Additional Trench Excavation”, as hereinafter defined. Excavation carried below the required level without authorization by the ENGINEER shall be backfilled at the Contractor’s expense with granular material

as approved by the ENGINEER. Compaction of such backfill material shall be as specified elsewhere herein.

99.3.5.2.2.7. **Excavation in Paved Areas** – when excavations are to be made in paved surfaces, the paved surfaces shall be line cut one (1) foot beyond each side of the trench and ahead of the excavation by means of pneumatic tool, saw cutting or other approved tools to provide a clean, uniform edge, with minimum disturbance of remaining pavements.

99.3.5.2.2.8. **Surplus Excavated Material** – excavated material not required for fill or backfill shall be disposed of by the Contractor. All excess materials shall be hauled to an approved spoil site. See 99.3.4.2.9. In general, suitable surplus excavated material may be used as embankment.

99.3.5.2.2.9. The Contractor shall use laser beam equipment to control the grade of the trench bottom as well as for pipe grade.

99.3.5.2.2.10. All pipe, unless otherwise permitted, shall be placed at least two (2) weeks prior to placing the final or permanent base course or pavements.

99.3.5.2.2.11. No pipe shall be placed unless a suitable outlet is provided. Pipe laying shall begin at the downstream end. The pipes shall be laid carefully in the bedding, with bells or grooves up grade in shaped recesses when required, spigot ends fully entered into the hubs, and true to the lines and grades.

99.3.5.2.3. **Rock Excavation in Trench and Payment**

99.3.5.2.3.1. **General Requirements** – the Contractor shall excavate, remove and dispose of rock in trench within the limits specified and in accordance with the Drawings and Specifications. Rock excavation in trench shall be defined as removal of boulders larger than one (1) cubic yard in volume and removal of ledge rock, concrete or masonry structures which cannot be ripped with a 1 ½ cubic yard backhoe or equivalent and requires drilling, blasting or other special methods for removal. For pipe installation, rock excavation shall be carried to a depth of ½ inch per foot of fill over the pipe with a minimum of six (6) inches and a maximum of twelve (12) inches below the outside perimeter of the pipe. The trench shall then be brought to proper grade for laying of the pipe by the placing of an approved aggregate bed. Methods and procedures to be followed for blasting operations shall be in accordance with the

requirements found elsewhere in these Specifications, for “Rock Excavations”, and specifically Section 99.3.4.2.11.4.

99.3.5.2.3.2. **Measurement and Payment** – should rock be encountered in the trench, such excavation may be considered as “Extra Work”, and the Contractor may be paid for “Rock Excavation in Trench”, as hereinafter defined (see Section 99.3.5.3). As soon as rock is encountered in the trench, it shall be uncovered by the Contractor and the ENGINEER shall be notified. The Contractor shall employ a Licensed Land Surveyor to measure the rock surface elevations along the length of the trench. These rock elevations shall be accurately plotted to scale on trench profiles and shall be certified by the Surveyor. The expense of taking said profiles and the plotting of same by the Licensed Land Surveyor shall be borne by the Contractor. A reproducible set of the certified profiles and a copy of the Surveyor’s field notes shall be provided to the ENGINEER, who shall use this data to compute the amount of rock excavated. The amount of rock excavated will be determined by the “Method of Average End Area”, with planimeter accuracy. Payment lines for rock excavation shall be as follows:

99.3.5.2.3.2.1. **Pipes, Conduits and Culverts Bottom Payment Line** – the elevation of the bottom payment line shall be a minimum of six (6) inches below the bottom outside diameter of the pipe as shown, or to the depth otherwise specified.

**Top Payment Line** – the top payment line shall be existing rock surface if below subgrade, or subgrade surface if below existing rock surface. Rock located above subgrade surface will be excavated and paid for in accordance with the requirements specified under the Article for “Excavation and Embankments”. The item of trench rock is only applicable below subgrade surface.

**Side Payment Line** – the width of excavation shall be as determined by the limits specified in the Section 99.3.5.2.2.3 above and extended to the bottom of the trench.

99.3.5.2.3.2.2. **Underground Structures: Including Manholes, Catch Basins and Inlets Walls** – for installation of walls and similar items, rock excavation shall be carried to the bottom of the foundations.

**Bottom Payment Line** – the elevation of the bottom payment line shall be 6” below the bottom of the footing or base.

**Top Payment Line** – same as for pipes, conduits and culverts.

**Side Payment Line** – shall be twelve (12) inches beyond the outside wall of the structure. The Unit Price bid for the “Rock Excavation in Trench” shall include furnishing and placing the approved aggregate bed as shown on the Details of the Drawings.

99.3.5.2.4. **Additional Trench Excavation**

99.3.5.2.4.1. **Authorized Changes and/or Alterations** – the ENGINEER may, as a result of unforeseen conditions arising during the progress of the work, order the grade or locations of any pipe or other structure changed from that established on the Drawings or from a location of any pipe or other structure, changed from that established on the Drawings or from a location previously designated in the field or may order the raising, lowering or alteration of any existing pipeline or structure, or order the removal of unsuitable material from the bottom of any trench.

99.3.5.2.4.2. **Additional Payment to Contractor** – should such changes or alterations result in an addition to the quantity of earth trench excavation, this additional earth excavation may be considered as “Extra Work” and payment for the same shall be made to the Contractor as hereinafter defined (see Section 99.3.5.3.).

99.3.5.2.4.3. **Credit** – should such changes or alterations result in a reduction in the quantity of earth excavation, a credit for the reduction in the amount of earth trench excavation occasioned by such change shall be made.

99.3.5.2.4.4. **Method of Measurement** – the quantity of additional earth excavation in trench measured for payment to the Contractor or reduction of earth excavation in trench measured for credit to the Owner, shall be determined by plotting the profile on the bottom of the trench as indicated on the Drawings and the final location of pipe and/or structure (s). The amount of earth excavation computed as payment or credit shall be the volume measured between these limits using a consistent width of trench as determined by the limits specified in Section 99.3.5.2.2.3. above for pipe and one (1) foot outside of walls for structure (s). The depth of the excavation shall

be limited to the lesser of the subgrade elevation, or two (2) feet above the outside top of pipe in embankments, as shown on the Details of the Drawings.

99.3.5.2.5. **Tunneling and Jacking of Pipe**

99.3.5.2.5.1. **General** – in all cases, tunneling or jacking shall be done upgrade. Payment shall be made at the unit price bid for the completed structure, complete with backfill and/or casing, as may be required.

99.3.5.2.5.2. **Tunnels** – where the Contract Plans require that a pipe is to be tunneled, the Contractor shall be required to provide adequate lining, ventilation and lighting of the tunnel. The pipe shall be blocked to the proper lines and grade. The space between the pipe and the tunnel surfaces shall be filled with a grout made of one part cement and eight parts granulated slag, limestone, or river gravel, or as otherwise specified.

99.3.5.2.5.3. **Jacking** – generally, reinforced concrete sewer pipe of the tongue-and-groove type may be placed by jacking where specified on the Contract Plans. Where PVC pipe is to be installed, a concrete or metal pipe of sufficient size shall first be jacked to the required line and grade and the pipe pushed through this shell. Jacking shall be done with approved hydraulic jacks with a jacking head of sufficient size to protect the pipe from injury.

99.3.5.2.5.4. **Optional Use** – the Contractor may install any pipe in the Contract by the tunnel or jacking method, subject to the approval of the ENGINEER. In such cases, no additional compensation will be allowed.

99.3.5.2.6. **Pipe Bedding**

99.3.5.2.6.1. **General Requirements** – pipe shall be bedded in accordance with the requirements of Class C, unless specifically directed otherwise in the Project Specifications. All aggregate that is detailed is to be limestone or river gravel unless otherwise specified.

99.3.5.2.6.1.1. **Class A Bedding** – the pipe shall be in continuous cradle consisting of Class B concrete (or better), reinforced when directed, placed under and around the pipe, having a thickness under the pipe of  $\frac{1}{4}$  the inside diameter but in no case less than four (4) inches, and extending up each side of the pipe for a depth of twenty-five percent (25%)

of the outside diameter. The cradle width shall be the outside diameter of the pipe plus four (4) inches on each side.

99.3.5.2.6.1.2. **Class B Bedding** – fine aggregate bedding, not less than six (6) inches thick shall be placed and accurately shaped by means of a template to provide a uniform bearing for the pipe. Fine aggregate in compacted layers shall be used as backfill to a point twelve (12) inches over the top of the pipes.

99.3.5.2.6.1.3. **Class C Bedding** – fine aggregate bedding, not less than four (4) inches thick shall be placed and accurately shaped by means of a template to provide a uniform bearing under the pipe. Fine aggregate or other non-compressible materials in compacted layers shall be added as backfill up to a point at one half of the pipe diameters.

99.3.5.2.6.1.4. **Class D Bedding** – the pipe shall be bedded with care in soil foundation shaped to fit the pipe exterior and minimum depth of fifteen percent (15%) of the outside diameter.

99.3.5.2.7. **Imperfect Trench** – when the height of the material over a rigid pipe exceeds the maximum, an imperfect trench shall be constructed. The pipe shall first be installed in accordance with the requirements for Class A or B bedding as specified. The trench shall be backfilled in accordance with the requirements of this Section to an elevation equal to the outside diameter of the pipe plus two (2) feet above the top of the pipe. Next, a trench equal in width to the exact outside diameter of the pipe shall be dug in the fill directly over the culvert, down to an elevation of 1 foot above the top of the pipe. Care shall be taken to keep the sides of this trench as nearly vertical as possible. After the trench is excavated, it shall be refilled with loose, highly compressible earth or other approved material. After the trench is backfilled, the embankment shall be placed and compacted in accordance with the Embankment Specifications.

99.3.5.2.8. **Backfilling**

99.3.5.2.8.1. **General Requirements** – after proper inspection and tests have been made, excavations shall be backfilled using the following backfill materials:

99.3.5.2.8.1.1. **Standard Backfill** – standard backfill will be onsite material approved by the ENGINEER. Should there be a deficiency of proper on site material for backfilling, the

Contractor shall furnish additional proper backfill material, at no additional cost to the Owner.

99.3.5.2.8.1.2. **Select Backfill** – soil material that is granular and free draining as approved by the ENGINEER. The Contractor shall furnish all necessary and required select backfill material at no additional cost to the Owner.

99.3.5.2.8.1.3. **Aggregate Backfill** – where indicated on the Drawings or specified herein, aggregate backfill consisting of durable particles graded from fine to coarse in reasonably uniform combination with 100% passing the 2 inch sieve, and no more than 15% passing the No. 200 sieve shall be supplied and compacted for trench backfill at no additional cost to the Owner.

99.3.5.2.8.1.4. **Filter Fabric** – may be required as directed by the ENGINEER during back fill procedure.

All Backfill material shall be free from large stones, clods, topsoil, sod, frozen earth, wood or any other objectionable material.

Unless otherwise specified, Standard Backfill shall be used. See also Section 99.3.5.2.8.4.

99.3.5.2.8.2. **Placement and Compaction** – backfill for pipe and ducts shall be placed evenly and carefully around and over the pipe in six (6) inch maximum layers. Each layer shall be thoroughly and carefully rammed until one (1) foot of cover exists over the pipe. The remainder of the backfill shall then be placed and compacted in maximum eight (8) inch layers. Each layer shall be compacted by approved mechanical tamping machines to a density equal to that of adjacent original material. Backfill shall proceed to the lines and grades as shown on the Drawings. Backfill areas that settle shall be corrected at the Contractor’s expense.

99.3.5.2.8.3. **Compaction Test** – compaction tests may be performed in accordance with ASTM Designation D-1557, Method D, or current edition, the following table gives the minimum compaction densities at optimum moisture required for passage of the compaction test.

Pipe Materials	Bedding	Initial Backfill	Final Backfill
Ductile Iron	90%	90%	75%
Concrete	90%	90%	80%
Polyvinyl Chloride	90%	90%	90%

In all cases, the densities shall be 95% for the final two (2) feet under the pavements.

99.3.5.2.8.4. **Trench in Pavements** – Sewers constructed in open cut, across any existing pavements and sidewalks, shall be backfilled with compacted aggregate, unless the material excavated is suitable for backfilling as approved by the ENGINEER, in which case, no special backfill will be paid for. In no special event shall aggregate be paid for beyond the theoretical trench width as determined by the limits specified in Section 99.3.5.2.2.3. above. Temporary repaving shall be placed as directed by the Township. Adherence to the referenced diagrams, Trench Repavement 95.5.1.2.5.

99.3.5.2.8.5. **Temporary Repaving** – where trenches or other openings have been cut through existing roadways or sidewalks and the new pavement is not to be placed immediately after backfilling, the Contractor shall provide a satisfactory surface for traffic and shall maintain this surface in good condition until the permanent surface is placed. Obtain a street opening permit from the Township. Adherence to the referenced diagrams, Trench Repavement 95.5.1.2.5.

99.3.5.2.8.6. **Removal of Sheeting** – during backfill operations, sheeting which is to be removed shall at no time extend in to the backfill, which is being compacted. The sheeting shall be withdrawn so as to always be above the backfill.

99.3.5.2.8.7. **Protection** – the Contractor shall be responsible for safe guarding all pipes and structures during the backfilling. Any damage to the pipe or structures occurring during the backfilling operations, or after the back filling operations have been completed, shall be corrected at the Contractor's expense.

99.3.5.2.8.8. **Clean Up** – when the backfilling is completed, all surplus material, rubbish, earth, etc. shall be removed and that portion of the ground or street surface cleaned and returned to its original contours and conditions. All damaged utilities and drains shall have been repaired and replaced. Clean up work shall follow immediately behind the pipe installation. As this initial clean up work is considered part of the “pipe, complete in place” item, payment for pipe will be considered only when the clean up under this Section is complete. Check off by the ENGINEER will be made from manhole to manhole and payment for sewers is to be withheld on this basis.

**99.3.5.2.9. Sheeting, Shoring and Bracing**

99.3.5.2.9.1. **General Requirements** – the Contractor shall furnish, install and maintain such sheeting, shoring, bracing and coffer damming, etc., as may be needed to support the sides and roofs of excavations and to prevent any earth or rock movements which might in any way diminish or affect the necessary width of the excavation, endanger the safety of persons, injure or delay the work, or jeopardize the safety or adjacent pavements, property, buildings or other structures. The Work of sheeting, shoring and bracing shall, at all times, be in accordance with requirements of all State, Federal, or local authorities having jurisdiction.

99.3.5.2.9.2. **Removal** – sheeting, shoring, and bracing shall be removed progressively up from the bottom of the trench as the compacted backfill is placed. In extraordinary conditions, the ENGINEER may direct that sheeting and shoring be left in place and paid for at the Unit Price Bid.

99.3.5.2.9.3. **Contractor to be Solely Responsible** – the Contractor shall be entirely and solely responsible for the adequacy and suffering of all supports and of all sheeting, bracing, shoring, cofferdamming, etc. The Contractor shall assume entire and sole liability for damages on account of injury to persons, adjacent pavements, and public and private property including, but not limited to, the Work under construction, buildings and other structures, which injury shall result directly or indirectly from Contractor's failure to install or to leave in place adequate and sufficient supports, sheeting, bracing, shoring, cofferdamming, etc.

**99.3.5.2.10. Disposal of Water**

99.3.5.2.10.1. **General Requirements** – the Contractor shall remove, by pumping or other means, any surface or groundwater which may accumulate in trench excavations free from water while work is being performed in them.

99.3.5.2.10.2. **Method of Disposal** – the water from the excavations shall be disposed of in such a manner as will not cause injury or damage to the public health, public property, nearby streams or rivers, the work contemplated or in progress, surfaces of the streets, nor cause any interference with the use of the same. The disposal of this water shall be performed in a manner satisfactory to the ENGINEER and authorities having jurisdiction. Drainage of water by way of the section of pipe under construction will not be permitted.

99.3.5.2.10.3. **Erosion Control** – the Contractor is advised that all operations must conform to the Section of these Specifications dealing in accordance with requirements of all State, Federal, or local authorities having jurisdiction with Erosion Control Measures and all applicable NPDES requirements and in accordance with requirements of all State, Federal, or Local authorities having jurisdiction.

99.3.5.2.10.4. **Protection of Masonry** – newly laid masonry shall be protected from damage resulting from dewatering operations by the use of canvas or other methods as may be approved. No water shall be allowed to pass across masonry or through pipes without the approval of the ENGINEER.

99.3.5.2.11. **Restoration**

99.3.5.2.11.1. **General Restoration** – as the work, or portions of the work is completed, and due allowance is made for the trench settlement, the Contractor shall complete the final grading and dressing up. This final clean up shall include the raking of the surface to remove all debris and stones. The Contractor will be required to replace, at his own expense, any pavement, curb, sidewalk, or other structure outside the trench area which has been damaged, has settled or moved out of alignment, either during the progress of the work or due to subsequent settlement by reason of trenching or improper backfilling. The area disturbed by the construction under this Contract shall be left in as good condition as it was before the commencement of the work and it shall be promptly and regularly maintained in such conditions during a period of two (2) years after the acceptance of the work. This work of maintenance shall apply only to items of material and workmanship improperly installed in the first instance and maintenance measures made necessary by the ordinary wear and tear occasioned by traffic shall not be at the expense of the Contractor. However, any repairs required because of unsatisfactory trench backfilling shall be at the expense of the Contractor.

99.3.5.2.11.2. **Trench Repaving** – the trench area disturbed at streets, driveways, approaches and sidewalks, shall be repaved with like materials to the same general appearances. Permanent repaving shall be completed within a reasonable time after pipe installation. Under conditions of heavy traffic or hazardous conditions, the ENGINEER may direct that repaving be completed at a specific time. Reference Illustration 99.5.1.2.5

99.3.5.2.11.2.1. **Definitions** – the several types of repaving and limits thereof are defined as follows:

99.3.5.2.11.2.1.1. **Street Repaving** – any repaving required on an improved public street or road, and having cut stone, concrete or bituminous surface.

99.3.5.2.11.2.1.2. **Driveway Repaving** – any repaving of the types described above required on improved road berms, private driveways or parking areas having a hard surface.

99.3.5.2.11.2.1.3. **Road Resurfacing** – resurfaced to match original surfaces with selected material

99.3.5.2.11.2.1.4. **Sidewalks** – repaving of concrete sidewalks.

99.3.5.2.11.2.1.5. **Curbs** – replacement of any type of curb to the original location, line, grade and cross-sections.

99.3.5.2.11.2.1.6. **Limits of Payment** – payment for trench repaving shall be limited to a width as determined by the limits specified in Section 99.3.5.2.2.3 above, plus 24 inches. 4'-6' will be considered as the maximum width of payment for sewers 15" or less in diameter. The Contractor will be required to repave, at his own expense, any pavement damaged beyond the trench zone. Payment for additional width will be allowed only with written approval of the ENGINEER for unusual conditions. All concrete surfaces shall be saw-cut along the theoretical repavement line, except that concrete pavement shall be removed and paid for to the next pavements joint, if said joint falls within two feet of the theoretical pavement line.

99.3.5.2.11.2.2. **Street Repaving** – the permanent shall match the cross-section, type and texture of the present pavement or shall conform to the details shown in the Drawings. The work shall match the existing pavement. Where County or State regulations require the use of reinforcing bars in concrete base slabs on their roads, no additional compensation will be allowed.

99.3.5.2.11.2.3 . **Driveway Repaving** – where the trench crosses private driveways and approaches, the trench shall be backfilled with compacted 2 A limestone or approved equal and paved as above specified for the street repaving.

99.3.5.2.11.2.4. **Road Resurfacing** – selected material similar to the existing material shall be used in the reconstruction or repair of unimproved streets or driveways. No additional compensation will be allowed in areas outside the trench zone, as defined, due to normal operations of excavations and backfill. Such areas shall be restored at the Contractor's expense.

99.3.5.2.11.2.5 . **Sidewalks** – where the trench requires the removal of concrete sidewalks, the entire slab shall be removed as directed by the ENGINEER and replaced after backfilling. Thickness of replaced concrete steps must be removed and replaced as part of the sewer work, payment will be made at the sidewalk unit price with the length determined as the sum of the riser and tread dimensions, unless otherwise specified in the Project Specifications. Reference Illustrations 95.5.4.1.a. & 95.5.4.1.b.

99.3.5.2.11.2.6 . **Curbs** – the Contractor shall replace all curbs, which are damaged or destroyed, at his own expense, except where an item is included in the Proposal Form. All new curbs shall match the size, shape, line, cross-section and grade of the original and/or adjacent curbs.

99.3.5.2.11.3. **Vegetated Areas** – topsoil shall be replaced on all unpaved areas to its original depth, but not less than four (4) inches. The surface shall be raked, removing all clods, stone, roots, and other objects. Seed and soil supplements shall be applied in conformance with PennDOT Publication 408, Section 804 or current edition. Seed shall be used in the proper season as follows:

99.3.5.2.11.3.1. Temporary seeding (at clean up)-Formula E

99.3.5.2.11.3.2 . Lawns-Formula B

99.3.5.2.11.3.3 . Fields, woods and pastures-Formula D

99.3.5.2.11.3.4 . Steep Slope (where specified)-Formula C

99.3.5.2.11.4. **Landscaping** – where the work requires the removal of walls, fences, shrubbery, or other such improvements, the Contractor shall replace as directed by the Township.

99.3.5.2.11.5. **Stream Crossings** – uniformly graded stone rip-rap shall be placed on all stream banks disturbed by the construction. The rip-rap shall be of such shape as to form a stable and dense protective surface, and be placed to a thickness of no less than one (1) foot. Unless otherwise specified, the rip-rap shall be graded as follows:

40% to 60% larger than 50 pounds

70% to 80% larger than 5 pounds

Rip-rap shall conform to Section 99.3.3.3.2 of this Specification. In accordance with requirements of all State, Federal, or local authorities having jurisdiction.

## 99.3.6. **Storm Drainage**

### 99.3.6.1. **Description**

99.3.6.1.1. **Scope** – work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment necessary and required to install all of the storm drainage facilities as specified in accordance with the contract Documents. This Work shall include but not be limited to:

99.3.6.1.1.1. Installation of drainage systems consisting of manholes, catch basins, inlets, end sections, pipes and all necessary required accessory connections to existing drainage facilities.

99.3.6.1.1.2. Alteration, reconstruction and/or conversion of existing structures, including resetting existing and/or new castings to grade as required.

99.3.6.1.1.3. Connection of building leader drains to the drainage system. In accordance with the Allegheny County Plumbing Code or directed by the Township.

99.3.6.1.1.4. Installation of underdrains, consisting of all pipes, fittings and required accessory items and operations, including connections to the proposed and/or existing drainage systems.

99.3.6.1.2. **Work Specified Under Other Sections** – the following related work is specified under other Sections:

99.3.6.1.2.1. Site Preparation

99.3.6.1.2.2. Soil Erosion and Water Pollution Control

99.3.6.1.2.3. Trench Excavation and Backfill

99.3.6.1.2.4. Cement Concrete

99.3.6.2. **Construction Details**

99.3.6.2.1. **General**

99.3.6.2.1.1. The Contractor shall install all drainage structures and pipe in the locations shown on the Drawings and/or as directed by the ENGINEER. Pipe shall be of the type and size specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

99.3.6.2.1.2. The installation of all drainage structures and pipe within the Public Rights-of-Way and/or Easements shall conform to the requirements of the agency having jurisdiction.

99.3.6.2.1.3. In general, all storm sewers shall be reinforced concrete pipe and/or (ADS) N-12 or HDPE Smooth Flow or as directed by the ENGINEER. See §99.3.6.3.1.4. for materials.

99.3.6.2.2. **Storage and Handling of Pipe**

99.3.6.2.2.1. **Storage** – storage of pipe on the job shall be in accordance with the pipe manufacturer’s recommendations.

99.3.6.2.2.2. **Handling** – all pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe.

99.3.6.2.3. **Damage to Pipe**

99.3.6.2.3.1. **General** – pipe which is defective from any cause, including damage caused by handling, and determined to be not repairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner. Pipe that is damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced at the Contractor’s expense.

99.3.6.2.3.2. **Minor Imperfections in Concrete Pipe** – concrete pipe with damage which is the result of minor imperfections in the

manufacturing is not acceptable (which do not affect the structural integrity of the pipe may be repaired in the field). Repairs shall be sound, properly finished and cured to the requirements of these Specifications.

99.3.6.2.3.3. **Damage of Bituminous Coatings** – minor damage to bituminous coatings or paved inverts of corrugated steel pipe may be repaired in the field by a hot application of asphalt cement, or cold asphalt repair material of an approved brand, if approved by the ENGINEER.

99.3.6.2.4. **Pipe Installation**

99.3.6.2.4.1. **Laying Pipe** – each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the Section of these Specifications entitled “Trench Excavation and Backfill” and the Details of the Drawings. Reference Section 99.3.5. Pipe shall be laid upgrade unless otherwise approved by the ENGINEER.

99.3.6.2.4.1.1. **Concrete pipe** – shall be laid with the lift holes on top of the pipe. After the pipe is installed, the lift hole shall be sealed with suitable concrete plugs. Bell and spigot pipe shall be laid with the bell and upgrade; tongue and groove pipe shall be laid with the groove end upgrade. The pipe shall be jointed so that there will be uniform space around the pipe. Trimming of the pipe shall not be allowed. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to the placing of a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and clean to obtain an even and close fitting joint. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded, so as to prevent movement or disturbance of the pipe.

99.3.6.2.4.1.2. **(ADS) N12-HDPS** – The pipe shall be laid on a compacted six (6) inch bed of PENNDOT #2A stone or gravel. Air-cooled blast furnace slag is also acceptable. The entire trench shall be backfilled with PENNDOT 2A crushed stone or gravel. The contractor’s attention is called to the fact that the backfilling must be thoroughly tampered in twelve (12) inch lifts to avoid settlement. If the sewer is located within the grassed area the trench will be backfilled with stone to six (6) inches above the top of the pipe. The remainder of the trench shall be backfilled with compacted

soil. All manufacturing requirements should be followed.  
See Section 99.3.6.3.

99.3.6.2.4.2. **Pipe Extensions** – where an existing pipe is to be extended the same type of pipe shall be used unless otherwise specified.

99.3.6.2.4.3. **Full Lengths of Pipe** – only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

99.3.6.2.4.4. **Pipe Entrances to Structures** – all pipe entering structures (e.g. manholes, catch basins, etc.) shall be cut flush with the inside face of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation. Reinforcing shall not be left exposed in a cut section of Reinforced Concrete Pipe. Only full sections of pipe shall be used where entering a structure which will be exposed to view, such as endwalls, headwalls, end sections, etc.

99.3.6.2.4.5. **Bedding and Backfilling** – the type of materials to be used in bedding and backfilling and the method and placement shall conform to the requirements of the Section of these Specifications entitled “Trench Excavation and Backfill”.

99.3.6.2.4.6. **Protection During Construction** – the Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and/or adjacent to any pipe shall be performed at the Contractor’s risk. At all times when pipe laying is not in progress, all open ends of all pipes shall be closed by approved temporary plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has been eliminated.

99.3.6.2.4.7. **Tolerance** – pipe shall be laid accurately to the line and grade as shown on the Drawings and/or as approved by the ENGINEER. Allowable tolerance shall be one half (1/2) inch on grade and one (1) inch on line in any section of pipe between structures except that the allowable tolerance shall be one quarter (1/4) inch on grade 2.0% or less. Deviations from these tolerances shall be a basis for rejection of the line pipe by the ENGINEER. Any

line which has been rejected shall be rebuilt to the correct line and grade by the Contractor at his own expense.

99.3.6.2.5. **Pipe Joints**

99.3.6.2.5.1. Pipe shall be joined as specified herein:

99.3.6.2.5.1.1. **Jointing concrete Pipe with Cold Applied Pipe Joint Sealers** – bell and spigot or tongue and groove pipe shall be wiped clean and dry before applying the sealer to the pipe joint. Before the pipes are placed in contact with each other, the spigot end or tongue end of the pipe shall be completely covered with an excess of sealer, and then the pipe shall be laid to the established line and grade so that the inside surfaces of abutting pipe are flush. The joint shall then be completely filled with the sealer so as to make a watertight seal. All excess material shall be removed from the inside of the pipe.

99.3.6.2.5.1.2. **Jointing Concrete Pipe with Rubber Gaskets** – a pre-molded rubber gasket shall be used where shown on the Drawings or as specified. The gaskets shall be installed according to the manufacturer's specifications.

99.3.6.2.5.1.3. Where specifically detailed on the Drawings that a storm sewer is also designed to function as an underdrain, only the bottom one-third (1/3) of the joint shall be sealed in conformance with paragraphs 1 or 2 above, and sufficient sealer applied at the crown of the pipe to assure rigidity of the joint.

99.3.6.2.5.2. **Protection of Joints** – backfilling may proceed immediately after joints are completed provided that the operation avoids damage to the joint, maintains the pipe in the proper alignment and grade, and provides satisfactory curing conditions for the joint sealer.

99.3.6.2.6. **End Sections**

99.3.6.2.6.1. **General Requirements** – the Contractor shall furnish and install end section in the locations and of the type and size specified on the Drawings and/or as approved by the ENGINEER.

99.3.6.2.6.2. **Installation** – method and manner of installation shall be as specified herein for installation of pipe.

**99.3.6.2.7. Manholes, Catch Basins and Inlets**

99.3.6.2.7.1. **General Requirements** – all manholes, catch basins and inlets shall be built in accordance with the Details and in the locations shown on the Drawings and as specified herein.

99.3.6.2.7.1.1. Structures shall be constructed of precast solid concrete block, cast-in-place Class A Concrete or precast concrete. Precast structures will require shop drawing approval by the ENGINEER.

99.3.6.2.7.1.2. No concrete or masonry shall be placed when the temperature is below 40° Fahrenheit, or when indications are for lower temperature within 24 hours, unless protection of concrete and masonry is provided by the Contractor. The Contractor shall take measures to prevent concrete and masonry from being exposed to freezing temperatures for a period of not less than five (5) days after installation. Approval of the method of protection by the ENGINEER shall not relieve the Contractor of his responsibility to protect the masonry from freezing, and any damage to the structure because of freezing. Any damage to the structure because of freezing shall be corrected by the Contractor at his own expense.

99.3.6.2.7.1.3. Manholes and inlets shall be constructed as soon as the pipe laying reaches the location of the structures. Should the Contractor continue his pipe laying without making provision for completion of the structures, the ENGINEER shall have the authority to stop the pipe laying operations until the structure is completed.

99.3.6.2.7.1.4. All manholes and inlets located in or adjacent to a pavement subgrade shall be provided with weep holes as indicated on the Details of the Drawings.

99.3.6.2.7.1.5. In constructing manholes and inlets, the Contractor shall accurately locate each structure and set accurate templates to conform to the required line and grade. Any structure which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

99.3.6.2.7.1.6. All pipes shall be cut and trimmed flush with the inside face of the structure.

99.3.6.2.7.2. **Inverts** – smooth concrete invert channels shall be constructed in all manholes and in all catch basins and inlets, to insure a smooth flow of water through the structure.

99.3.6.2.7.2.1. The invert channel shall be constructed to the elevation shown on the Drawings. Channels shall slope smoothly and evenly from the entrance pipe to the outlet pipe.

99.3.6.2.7.2.2. Split concrete pipe may be used as invert channels will only be considered in those instance where the drain line is of concrete pipe and the major inflow pipe and outflow pipe are of the same size and alignment.

99.3.6.2.7.2.3. Invert channels shall be built for future extensions where shown on the Drawings. All inverts must be constructed to be a self-cleaning manner

99.3.6.2.7.3. **Frames, Covers, and Gratings** – Frames, covers and/or gratings for manholes, and inlets shall be of the type and size indicated on the Drawings. Frames shall be set in bituminous sealer, CONN seal or equivalent and shall be set accurately to the correct alignment and grade. Manhole frames shall be anchored to the manhole masonry with ½” bolts. In areas to be paved, frames shall be set by using four (4) points of reference, set 90° apart, to insure accurate setting to proposed pavement grade. Where inlets are to be placed on curb lines or at edge of pavements, sufficient length of proposed curb or edge of pavement adjacent to the structure shall be established prior to the construction of the inlet to insure that the structure is correctly located and oriented. All lids must have center holes.

99.3.6.2.7.4. **Ladder Rung** – ladder rungs shall be installed in all manholes, spaced twelve (12) inches on center vertically. Rungs shall be set securely in place during the construction of the masonry wall. Ladder rungs shall also be installed in all catch basins and inlets greater than three (3) feet in depth unless otherwise specified.

99.3.6.2.7.5. **Precast Structures** – precast structures shall be installed only after shop drawings have been approved.

99.3.6.2.7.5.1. The base of the precast structures shall be set in a minimum 2 ½ inch thick grout pad. Grout around pipes which protrude through the walls of the structure and on all joints shall contain water displacing sealant, or other approved additive, to insure water tightness.

99.3.6.2.7.5.2. The top of the precast concrete corbel section shall be set sufficiently below finished grade to permit courses of brick to be used as risers to adjust the grade of the casting, as approved by the ENGINEER. Manhole frames shall be set of a grout pad as specified herein.

99.3.6.2.7.6. Manholes, inlets, and structures shall be thoroughly cleaned prior to acceptance.

99.3.6.2.8. **Connections to Existing Facilities**

99.3.6.2.8.1. **General Requirements** – the Contractor shall make all required connections of the proposed drainage facilities into existing drainage facilities, where and as shown on the Drawings, including implementing modifications to the storm water management and erosion control facilities on the site.

99.3.6.2.8.2. **Compliance with Requirements of Owner of Facility** – connections made into existing drainage facilities shall be performed in accordance with the requirements of the Owner of the facility. The Contractor will be required to comply with all such requirements. The cost of making the connections in accordance with the requirements of the Owner of the existing facility shall be included in the Contract Unit Price for the pipe.

99.3.6.2.8.3. **Erosion control** – the Contractor shall be familiar with the erosion control plan for the site and avoid disturbance to the plan. The Contractor shall be responsible for modifications to the plan as storm sewers are constructed to carry storm flows. The ENGINEER may specify new inlet or manhole structures that will be used for surface water collection. The Contractor will then:

99.3.6.2.8.3.1. Complete the structure only to a grade 6 inches below the subgrade elevation.

99.3.6.2.8.3.2. Construct an earth mound 2 feet high and 6 feet wide, immediately down grade from the structure and of sufficient length to collect surface flows.

99.3.6.2.8.3.3. Install a filter fabric and/or straw bale filter around the structure.

99.3.6.2.8.3.4. Remove and/or backfill all existing drainage intercept or ditches or channel construction as the sewer construction progresses.

99.3.6.2.8.3.5. Maintain the erosion control facility and remove silt accumulations after heavy storms and/or when the capacity of the impoundment is reduced by 25%.

99.3.6.2.8.3.6. Complete the structures to finish grade when directed and remove embankments and filters when and as site drainage and erosion conditions permit.

99.3.6.2.8.3.7. Utilization of new storm sewers for temporary site drainage by the Owner shall not be construed as final acceptance of the sewer by the Owner.

99.3.6.2.9. **Reconstruction of Existing Structures**

99.3.6.2.9.1. **General Requirements** – the contractor shall alter, reconstruct existing structures where and as shown on the Drawings. In general, reconstruction shall be rebuilt completely in accordance with this code unless otherwise indicated in the Drawings.

99.3.6.2.9.2. **Adjustment to New grade and Alignment** – all castings on existing drainage structures that are to remain shall be adjusted to the new grade and alignment. When such adjustment is required, the structure shall be completely rebuilt as directed by the ENGINEER. The castings shall be cleaned and reset in a firm mortar bed to the new grade and alignment. Existing castings which are broken, damaged or otherwise unfit for incorporation in the new Work shall be replaced.

99.3.6.2.9.3. **Structures to be Converted** – structures which are to be converted (e.g. manholes to catch basins, catch basins to manholes) shall conform as closely as possible to the design of the proposed structure. Sufficient masonry shall be removed from the existing structure to insure that the walls can be rebuilt to conform to the proposed construction. Furnishing and installation of new castings for the converted structures shall be included in the Contract Price.

99.3.6.2.9.4. **Removal of Portions of Walls of Existing Structures** – in cases of alteration, reconstruction and/or conversions of existing structures, existing walls shall be removed to a point where the existing walls will provide sound and adequate foundation for the construction of the new walls.

99.3.6.2.9.5. **Damage to Existing Structure and/or Pipe** – the Contractor shall exercise extreme care during such alteration,

reconstruction and/or conversions so as to not damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense.

99.3.6.2.9.6. **Structures to be Cleaned** – upon completion of alteration, reconstruction and/or conversion of existing structures, all structures shall be cleaned of any accumulated silt, debris or foreign matter of any kind and shall be kept clean of such accumulation until final acceptance of the Work.

99.3.6.2.10. **Reconstruction and/or Abandonment of Existing Facilities**

99.3.6.2.10.1. The Contractor shall not abandon, disconnect, obstruct, or in any other way interfere with the operation of an existing storm drain facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

99.3.6.2.10.2. The upgrade end of all abandoned storm sewers shall be plugged with a bulkhead approved by the ENGINEER.

99.3.6.2.11. **Leader Drains**

99.3.6.2.11.1. **General Requirements** – the Contractor shall make all required connections of existing building leader drains into the drainage system where and as shown on the Drawings. Work shall include making the leader drain connections into the drainage system, furnishing and installing all leader drain pipe from the existing drainage system to the new and/or existing sewer.

99.3.6.2.11.2. **Coordination with Building Contractor** – the Contractor will be required to coordinate his work with the work of the Building Contractor to determine the exact location and elevation of the point of entry into the building. If the Building Contractor has installed his portion of the leader drain, work under this Contractor shall also include final connections of the leader drains at no additional cost to the Owner.

99.3.6.2.11.3. **Connections into Drainage System** – leader drain connections to the pipe of the drainage system shall be made at structures or with proper fittings supplied by the pipe manufacturer. Where manufacturer's fittings are not available, the Contractor shall cut a neat circular hole in the drainage pipe to facilitate connection of the leader drainpipe.

**99.3.6.2.12. Underdrains**

99.3.6.2.12.1. **General Requirements** – the Contractor shall install all underdrains where and as shown on the Drawings.

99.3.6.2.12.2. **Pipe Installation** – underdrain pipe of the type and size specified shall be embedded firmly on the prepared trench bottom to the line and grade shown on the Drawings. Approved filter material shall be uniformly placed around and over the pipe and as detailed on the Contract Plans. Unless otherwise specified, perforated pipe shall be laid with the perforations down and the pipe sections shall be joined securely with the appropriate fittings or bands. Upgrade ends of pipe underdrains shall be closed with suitable plugs. Where a storm sewer is designed to also serve as an underdrain, the pipe bedding and backfill shall be completed up to the 1/3 point of the pipe diameter. The balance of the backfill shall be in conformance with this “Underdrain” Specification.

99.3.6.2.12.3. **Backfilling** – after the pipe installation has been inspected and approved, underdrain filter material shall be hand shoveled around and over the pipe to such a depth that, after compaction, it extends a minimum of 4 inches above the underdrain pipe. The surface of the underdrain filter material shall then be compacted with a vibrating plate compactor, and the remainder of the filter material placed in 6 inch lifts, each thoroughly compacted with a vibrating plate compactor. The height of filter material over all pipe shall be as indicated on the Drawings.

99.3.6.2.12.4. **Pipe connections and Changes in Alignment** – pipe to pipe connections and changes in the pipe alignment shall be made only with prefabricated fittings to be supplied by the manufacturer of the pipe (e.g. trees, wye ranches, etc.).

**99.3.6.2.13. Leakage Tests - Sanitary/Storm**

99.3.6.2.13.1. **General Requirements** – the Contractor may be required to perform leakage tests on the system in accordance with the requirements of this Specification only when indicated in the Project Specifications, including infiltration and exfiltration tests. All labor, materials and equipment required to perform leakage tests shall be furnished by the Contractor at his own expense. All water used for exfiltration tests shall be of quality acceptance to the ENGINEER. Prior to acceptance of the pipe type and joints, line or system, the tests and measurements of infiltration shall be conducted in a manner approved by the ENGINEER, and shall apply to the

whole system or any portion thereof. All tests shall be made and conducted by the Contractor in the presence of the ENGINEER.

99.3.6.2.13.2. **In-Place Methods of Testing** – the first segment of any line between 2 manholes shall be tested as soon as possible after backfilling has been completed to at least 2 feet above to top of the pipe. If such tests appear to be satisfactory and acceptable, progressive testing of completed sections of the lines may be deferred until all pipe has been laid, but before final acceptance. However, if permitted, this procedure will not constitute a waiver of any of the tests or the leakage requirements. All tests shall be performed for a minimum period of 4 hours. Where the Crown of the pipe is below the natural groundwater table at the time and place of testing, the pipe shall be tested for infiltration. Suitable watertight plugs shall be installed and the section of pipe to be tested shall be pumped dry before start of test. Where the crown of the pipe is above the natural groundwater table, the pipe shall be tested for exfiltration by installing necessary plugs, filling pipes and manholes with water and during the test maintaining a static head of water a minimum of 2 feet above the crown of the pipe. All manholes, catch basins, curb inlets and other appurtenances to the system shall be tested for water tightness by filling with water and visual inspection of the exfiltration rate.

99.3.6.2.13.3. **Pre-Placement Method of Testing** – each test section shall include 2 separately manufactured sections of pipe joined together at the finished ends by the approved jointing method for the project. A test shall be made on each size of pipe of each material. The pipes shall then be cut, where required, to provide a test section at least ten (10) feet in length. Each open end of the test section shall then be bulk headed with an appropriate adaptable plate, one of which shall be fitted with a water valve and an air valve and pressure gage. The bulkhead shall be attached to the pipe by an approved method consistent with the type of pipe being tested. Fabrication of the test section shall be performed in the field, and shall be selected at random from the materials delivered to the job site. Upon completion of the fabrication, the test section shall be placed vertically and filled with water through the valve in the bulkhead. When the test section has been completely filled with water the water valve shall be closed and an appropriate source of compressed air attached to the air valve. Air shall be added to the test section until a pressure of 5 p.s.i. maintained for a period of 4 hours. After 4 hours, the pressure shall be released, without expelling water, and the test section filled with the measured amounts of water to determine the leakage for the test section.

99.3.6.2.13.4. **Test Results** – the ENGINEER shall be supplied a copy of the test results which shall include amount of leakage and the location of the observed leaks relative to joints, seams, etc. Leakage of the test section shall not exceed 0.1 gallons per day per inch of pipe diameter per lineal feet of laying length between joints. If the test results are outside the above limits, the Contractor shall propose remedial action for approval of the ENGINEER. Upon approval and performance of such remedial action the test shall be re-run. Installation of the approved pipe shall include the remedial measures which were required in the testing of the pipe.

99.3.6.2.13.5. **Corrections of Defective Work** – any defects found in the system are to be made good at the expense of the Contractor so as to conform strictly to the Specifications. All repaired shown necessary by the tests are to be made. Broken or cracked pipe shall be replaced, all deposits removed, the drain left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc. and ready for use before final acceptance is made.

99.3.6.2.14. **Cleaning and Repair**

99.3.6.2.14.1. The Contractor will be required to clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams; all debris shall be removed from the system as well as any temporary or permanent detention ponds. Appropriate certification and disposal is required and will be performed by the contractor at no cost to the TOWNSHIP.

99.3.6.2.14.2. After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be promptly made by the Contractor.

99.3.6.2.14.3. All work of cleaning and repair as specified herein shall be performed at the Contractor's expense.

99.3.6.2.15. **Final Inspection** – upon completion of the Work and before final acceptance by the Owner, the entire drainage system shall be subject to a final inspection in the presence of the ENGINEER and the Owner's Representative. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been

completed to the satisfaction of the Owner’s Representative and the ENGINEER<sup>1</sup>.

99.3.6.3. **Materials** – the materials to be used in the construction shall be those indicated on the Drawings and specified herein:

99.3.6.3.1. **Storm Drain Pipe, Fittings and Joints**

99.3.6.3.1.1. **Reinforced Concrete Pipe (RCP) or (RCP-S)** – shall conform to the “Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe”, AASHTO Designation M-170. Pipe joints shall be so designed to utilize watertight rubber gaskets as a jointing treatment. Reinforced Concrete Pipe shall be used for all pipes fifteen (15) inches in diameter and larger, unless otherwise specified. If concrete pipe is to be used on railroad tracks, the railroad standards for pipe construction must be followed. A permit must be obtained from appropriate railroad.

99.3.6.3.1.2. **Reinforced Concrete Pipe (REP-G)** – shall conform to the “Specifications for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe,” AASHTO Designation M-170. Pipe joints shall be so designed to utilize watertight rubber gaskets as a jointing treatment.

99.3.6.3.1.3. **Maximum Depth of Cover for Concrete Pipe** – unless otherwise specified in the Project Specifications, the following guide for the maximum pipe cover shall be used:

99.3.6.3.1.3.1. **Maximum Depth of Cover (Feet)**

99.3.6.3.1.3.1.1. All concrete pipe shall have a minimum cover of 2 feet below finished grade or one foot below subgrade. Cover for crossing of construction equipment, except that required for subgrade preparation, shall be 2 feet.

Class	NCP	RCP	RCAP	RCHEP	RCVEP
II	9	9	9	9	x
III	13	13	13	12	x
IV	x	19	19	17	15
V	x	28	x	x	23

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<sup>1</sup>Editor’s Note: Former Subsection 99.3.6.2.15.1 has been deleted 3-2-09 by Ord. No. 2019.

99.3.6.3.1.4. **(ADS) N12 Pipe** – pipe and fittings may be used where approved by the ENGINEER and shall meet the requirements of ASTM designation F-405 (and/or AASHTO Designation M-252). Installation shall be in conformance with standards detailed in ASTM Designation F-449.

99.3.6.3.1.4.1. **Minimum Depth Cover** – Minimum recommended depths of cover for various live loading conditions are summarized in the following table. Unless otherwise noted, all dimensions

Surface Live Loading Condition	Recommended Cover in (mm)
H25 (Flexible Pavement)	12 (300)*
H25 (Rigid Pavement)	12 (300)
E80 Railway	24 (610)
Heavy Construction	48 (1220)
*Top of pipe to bottom of bituminous pavement section	

99.3.6.3.1.4.2. **Maximum Depth of Cover** – Maximum in height of sixty (60) feet for pipe sizes up to and including thirty-six (36) inch and thirty (30) feet. For forty-two (42) and forty-eight (48) inch, ADS recommends a maximum fill height of thirty (30) feet. Greater fill heights for all pipes are possible provided attention is given to backfill materials and compaction. For fills exceeding ADS recommendations, contact an ADS representative to review site specific data.

99.3.6.3.1.4.2. **Foundation** – Where the trench bottom is unstable, the contractor shall excavate to a depth required by the ENGINEER and replace with a foundation of Class I or II material as defined in ASTM D2321, “Standard Practice for Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications,” Latest Edition; as an alternative and at the discretion of the ENGINEER, the trench bottom may be stabilized using a woven geotextile fabric.

99.3.6.1.4.3. **Bedding** – Suitable material shall be Class I, II or III and installed as required in ASTM D2321, latest edition. Unless otherwise specified by the ENGINEER, minimum bedding thickness shall be four (4) inch (100mm) for four (4) inch to twenty-four (24) inch (100-600mm) and forty-two (42) inch to forty-eight (48) inch (1050-1200mm)

for thirty (30) inch to thirty-six (36) inch (720-900mm) CPEP.

99.3.6.1.4.4. Haunching and Initial Backfill – Suitable material shall be Class I, II or III and installed as required in ASTM D2321, latest edition.

99.3.6.1.5.4. Unless otherwise specified by the ENGINEER, minimum trench widths shall be as follows:

Nominal Diameter in (mm)	Minimum Recommended Trench Width in (mm)
4 (100)	21 (530)
6 (150)	23 (580)
8 (200)	25 (630)
10 (250)	28 (710)
12 (250)	31 (790)
15 (375)	34 (860)
18 (450)	39 (990)
24 (600)	48 (1220)
30 (750)	66 (1680)
36 (900)	78 (1980)
42 (1050)	83 (2110)
48 (1200)	89 (2260)
60 (1500)	102 (2590)

99.3.6.3.2. **Underdrain Pipe and Filter Material**

99.3.6.3.2.1. **Corrugated Polyethylene Pipe (ADS)** – pipe and fittings shall conform to AASHTO Designation M-252.

99.3.6.3.2.6. **ABS Pipe** – Acrylonite-Butadiene Styrene Pipe and fittings shall conform to ASTM Designation D-2412. In addition, the pipe shall be capable of being flattened to 60% of its diameter without splitting, cracking or breaking.

99.3.6.3.2.7. **PVC Pipe** – Polyvinyl Chloride Pipe and fittings shall conform to ASTM Designation D-3034. In addition, the pipe shall be capable of being flattened to 40% of its diameter without splitting, cracking, or breaking.

99.3.6.3.2.8. **Geotextiles** – shall conform to the requirements of PennDOT Publication 408, Section 735, Class 1 and installed in conformance with Publication 408, Section 212.3 (b).

99.3.6.3.2.9. **Filter Material** – shall be approved crushed aggregate with no less than 85% by weight passing the 3/8” screen and 100% by weight retained on the #35 screen.

99.3.6.3.3. **Structures**

99.3.6.3.3.1. **Precast Manholes and Inlets** – As where as called for on the Drawings or approved in writing by the ENGINEER, the Contractor (may substitute) shall use precast manholes, (catch basins) and/or inlets. Precast Reinforced Concrete Manholes Sections shall conform to the “Specifications for Precast Reinforced Concrete Manhole Sections,” AASHTO Designation M-199. All precast concrete manholes shall be furnished with inserts to receive anchor bolts. Prior to fabrication, the Contractor shall submit 4 sets of plans of the proposed precast structures to the ENGINEER for approval, along with design criteria and certification by the manufacturer that the structure will support the design load. The minimum compressive strength of the concrete used for all precast structures shall be 4,000 psi. Where steps are required in structures, steps shall be installed during the casting of the structures, aligned as specified herein. Joints in the structures shall be tongue and groove joints, formed in such a manner so that either a mortar or rubber seal can be applied. No precast manhole or inlet shall be fabricated or delivered to the job site until shop drawings have been approved by the ENGINEER. All structures shall have the structure number and manufacturer’s name on each section. Approval of the use of precast structures shall relieve the Owner of any additional costs for modifications of openings due to line or grade changes, deletion of structures, relocations of structures or additional or deletion of lines to be connected into the structures, and such additional cost shall be at the Contractor’s expense.

99.3.6.3.3.4. **Manhole Frames and Covers** – shall be gray cast iron castings, conforming to the requirements of AASHTO Designation M-105, latest revision, Class 30. The castings shall be true to pattern in form and dimensions as specified and shall be free from pouring faults, sponginess, crack, blowhole and other defects that affect their strength and other characteristics for the intended use. All surfaces shall have a workmanlike finish. Manhole frames shall have anchor bolt slots to match the manhole insert locations. All component parts shall fit together in a satisfactory manner and frames and cover shall be of non-rocking design so as to prevent rocking and manhole lids must have center pick hole. Frames and grates that are warped or rocking, will be rejected and shall be removed and replaced by the Contractor at no cost to the Owner.

99.3.6.3.3.5. **Inlet Frames and Grates** – shall be cast iron and/or fabricated steel as specified on the Drawings and in accordance with the following requirements:

99.3.6.3.3.5.1. **Cast Iron** – shall be gray cast iron castings conforming to the requirements of AASHTO Designation M-105, latest version, Class 30. All requirements of workmanship and material as specified for manhole castings shall apply herein, all casting types shall be approved by the ENGINEER. All component parts of the frames and grates shall fit together in a satisfactory manner and frames and covers shall be of a non-rocking design so as to prevent rocking or rattling under traffic. Frames and grates that are warped or rocking will be rejected and shall be removed and replaced by the Contractor at no cost to the Owner.

99.3.6.3.3.7. **Reinforcement** – shall be new billet stock deformed steel bars conforming to AASHTO Designation M-31, grade 40 or as approved by the ENGINEER. Steel wire fabric shall conform to AASHTO Designation M-55 or approved by the ENGINEER. Metal accessories-chairs, toes and other items necessary for proper placement of reinforcing shall be free from scale, oil, ice and structural defects and shall be stored so as to prevent contact with the ground.

99.3.6.3.3.8. **Mortar** – shall be composed of one part Portland cement and two parts sand by volume. Hydrates lime not to exceed 4 pounds of lime to each bag of cement may be added if approved by the ENGINEER. Material requirements shall be as follows:

99.3.6.3.3.8.1. **Portland Cement** – shall conform to the requirements of AASHTO Designation M-85, Type II.

99.3.6.3.3.8.2. **Hydrated Lime** – shall conform to the requirements of ASTM C-6.

99.3.6.3.3.8.3. **Mortar Sand** – shall conform to the requirements of AASHTO Designation M-45, except that aggregate shall be no coarser than #8 sieve above.

99.3.6.3.3.8.4. **Water** – shall be clean and shall not contain any oil, acid, alkali, slats, vegetable matter, organic matter or other deleterious substances. Water shall be from a municipal system.

Hand mixing of mortar will be permitted only when the amount of mortar to be used makes machine mixing undesirable. When hand mixing is used, the ingredients must first be thoroughly mixed dry, in a tight box, after which the proper quantity of clean water shall be gradually added and then the materials shall be hoed or worked until a uniform mixture is secured. Additives can only be added to the mixture when prior written approval is obtained and in the presence of the ENGINEER. No greater quantity of mortar is to be prepared than is required for immediate use, and it shall be worked over constantly with hoe or shovel until used. No mortar shall be retempered, and none shall be used more than 1 ½ hours after mixing. All mortar mixture, which remains upon stopping work, shall be discarded.

99.3.6.3.3.9. **Ladder Rungs** – manhole and inlet ladder rungs shall be made of one the following materials and shall meet the requirements of ASTM A 615 M, Grade 400 (A615, Grade 60).

99.3.6.3.3.9.1. Copolymer Polypropylene Plastic are required for all ladder rungs shall be true to pattern, form, dimensions, and free from pouring defects, which would affect their strength. Steps having pouring defects filled with putty or cement of any kind will be rejected.

## 99.3.7. **Sanitary Sewers**

### 99.3.7.1. **Description**

99.3.7.1.1. **Scope** – work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment necessary and required to install all of the sanitary sewer facilities in accordance with the Contract Documents. This Work shall include but not be limited to:

99.3.7.1.1.1. Installation of sanitary sewers consisting of manholes, drop connections, pipe and all necessary and required accessory items and operations including connections to existing facilities.

99.3.7.1.1.2. Alteration and/or reconstruction of existing structures including resetting existing and/or new castings to grade as required.

99.3.7.1.1.3. Alteration, reconstruction and/or relocation of existing sanitary sewer facilities as required.

99.3.7.1.2. **Work Specified Under Other Articles** – the following related work is specified under other Sections:

99.3.7.1.2.1. Site Preparation

99.3.7.1.2.2. Soil Erosion and Water Pollution Control

99.3.7.1.2.3. Trench Excavation and Backfill

99.3.7.1.2.4. Cement Concrete

99.3.7.2. **Construction Details**

99.3.7.2.1. **General**

99.3.7.2.1.1. The Contractor shall install all sanitary sewer structures and pipe in the locations as shown in the Drawings. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.

99.3.7.2.1.2. The installation of all sanitary sewer structures and pipe shall conform to the requirements of all agencies having jurisdiction, including the Pennsylvania Department of Environmental Protection.

99.3.7.2.2. **Storage and Handling of Pipe**

99.3.7.2.2.1. **Storage** – storage of pipe on the job shall be in accordance with the pipe manufacturer’s recommendations as approved by the ENGINEER.

99.3.7.2.2.2. **Handling** – all pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe.

99.3.7.2.3. **Damage to Pipe**

99.3.7.2.3.1. Pipe which is defective from any cause, including damage caused by handling, shall be unacceptable for installation and shall be removed from the site at no cost to the owner.

99.3.7.2.3.2. Pipe that is damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced at the Contractor’s expense.

99.3.7.2.4. **Pipe Installation**

99.3.7.2.4.1. **Laying Pipe**—each length of pipe shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with the Section of these Specifications entitled “Trench Excavation and Backfill”, reference §99.3.5. Pipe will be laid upgrade with bells upgrade. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing the next pipe section in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so that joints may be properly assembled without overstressing the bells. No pipe is to be trimmed or chipped to fit. No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

99.3.7.2.4.2. **Pipe Extension** – where pipe is to be extended, the same type of pipe shall be used unless otherwise specified or approved by the ENGINEER.

99.3.7.2.4.3. **Full Length of Pipe** – only full lengths of pipe are to be used in the installation except partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

99.3.7.2.4.4. **Pipe Entrances to Structures** – all pipe entering structures shall be cut flush with the inside face of the structure, and the cut ends of the pipe surface of the structure shall be perfectly rounded and finished so that there will be no protrusion, ragged edges or imperfections that will impede the flow of water to affect the hydraulic characteristics of the installation.

99.3.7.2.4.5. **Bedding and Backfilling** – the type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of the Section of these Specifications entitled “Trench Excavation and Backfill,” reference §99.3.5. and/or as shown on the Drawings or as specified in the Project Specifications.

99.3.7.2.4.6. **Protection During Construction** – the Contractor shall protect the installation at all times during construction. Movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor’s risk.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by approved temporary water tight plugs. If water is in the trench when work is resumed, the plug shall not be

removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

99.3.7.2.4.7. **Tolerance** – pipe shall be laid accurately to the line and grade as shown on the Drawings. Allowable tolerances shall be ¼ inch in grade and ½ inch in line in any section of pipe between manholes. No adverse grades shall be allowed. Deviations from these tolerances shall be grounds for rejection of the line of pipe. Any line, which has been rejected, shall be rebuilt to the correct line and grade by the Contractor at his own expense. Laser technology or approved equal shall be utilized.

99.3.7.2.5. **Pipe Joints**

99.3.7.2.5.1. All joints are to be made watertight in accordance with the requirements specified herein.

99.3.7.2.5.2. Pipe shall be joined in strict accordance with the pipe manufacturer's instructions. Jointing of all pipe shall be done entirely in the trench.

99.3.7.2.6. **Manholes**

99.3.7.2.6.1. **General Requirements** – all manholes shall be built in accordance with the details and in the locations shown on the drawings and as specified herein.

99.3.7.2.6.1.1. Structures shall be constructed of precast Concrete. Precast structures will require Shop Drawing approval by the ENGINEER.

99.3.7.2.6.1.2. No concrete or masonry shall be laid when the temperature is below 40° Fahrenheit, or when indications are for lower temperatures within 24 hours, unless protection of concrete and masonry is provided. In the event, the Contractor shall take such measure to prevent concrete and masonry from being exposed to freezing temperatures for a period of not less than 5 days after installation. Any damage to the structure because of freezing shall be corrected by the Contractor at his own expense.

99.3.7.2.6.1.3. All masonry shall be installed by personnel experienced and skilled in this work.

99.3.7.2.6.1.4. Manholes are to be constructed as soon as the pipe laying reaches the location of the manhole. Should the

contractor continue his pipe laying without making provision for completion of the manhole, the ENGINEER shall have the authority to stop the pipe laying operations until the manhole is completed.

99.3.7.2.6.1.5. In constructing manholes, the Contractor shall accurately locate each manhole and set accurate templates to conform to the required line and grade. Any manhole which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

99.3.7.2.6.1.6. All pipes shall be cut and trimmed flush with the inside face of the structures.

99.3.7.2.6.2. **Foundations** – Unless otherwise specified, all manholes shall be constructed on foundations constructed of Class A concrete, and all foundations shall rest on firm ground of uniform bearing.

99.3.7.2.6.3. **Masonry** – All adjustments to grade must be approved by the ENGINEER. If the brick or concrete blocks are utilized, they must be thoroughly wetted before laying. All masonry shall be laid in a full bed of mortar, and all vertical and horizontal joints shall be filled solid with mortar. Vertical joints on each succeeding course shall be staggered. Joints shall be not less than 3/8 inch or more than 1/2 inch wide. Joints on the inside on the structure shall be neatly struck and pointed. The exterior surface of the masonry walls shall be plastered with a 1/2 inch coat of the 1:2 cement mortar.

99.3.7.2.6.4. **Inverts** – Smooth concrete invert channels shall be constructed in all manholes with a true semi-circle channel to insure a smooth flow of water through the structure. The following are the details to be adhered to unless approved by the ENGINEER. In addition, any inverts shall be constructed as shown on the drawings.

99.3.7.2.6.4.1. Minimum slope of 1/2 in/ft from the channel to the inside diameter (ID) of riser wall for the benching.

99.3.7.2.6.4.2. Minimum channel invert depth of one-half the pipe ID.

99.3.7.2.6.4.3. When a base section is pre-cast monolithically with a benched invert, the minimum concrete thickness from the invert to the bottom of the integral base section shall be four (4) inches.

99.3.7.2.6.4.4. When a channel is cast in a cured base section, the minimum concrete thickness under the invert shall be two (2) inches.

99.3.7.2.6.4.5. Width of the channel at the top of benching shall be a minimum of the pipe ID.

99.3.7.2.6.4.6. Invert shall provide a positive flow between inlet to outlet pipes.

99.3.7.2.6.4.7. The minimum channel centerline radius shall be the pipe ID.

99.3.7.2.6.5. **Frames and Covers** – Frames and covers for manholes shall be of the type and size indicated on the Drawings and shall be equipped with center holes. Frames shall be well bedded in bituminous mastic CONN seal or equivalent to, anchored with ½ inch bolts, and shall be set accurately to the correct alignment and grade. In areas to be paved, frames shall be set by using four points of reference, set 90° apart, to insure accurate setting to proposed pavements grade.

99.3.7.2.6.6. **Ladder Rungs** – Ladder rungs shall be installed in all manholes, spaced twelve (12) inches on center vertically. Rungs shall be set securely in place during the construction of the masonry wall. Deformed reinforcement bars, ASTM A 615M, Grade 400 (A615, Grade 60), coated with copolymer Polypropylene plastic that meets the requirements of ASTM D4101; Table PP; Group 3 Copolymer or Impact Modified; Class 2, 3 or 4; any grades 1 through 9. (605-1 Pub 408)

99.3.7.2.6.7. **Precast Manholes** – precast manholes shall be installed only after Shop Drawings have been approved.

Manhole connections and grout around pipes which protrude through the walls of the manhole shall contain “Antihydro,” or other additive, to insure water tightness. Cement grout shall contain 2 parts cement to one part sand and additive in accordance with manufacturer’s recommendations. Mortar shall be applied to the bottom 1/3 of the opening before the pipe is inserted.

The joints of manhole sections shall be made watertight, using o-rings or preformed mastic material. All lift holes shall be plugged with cement mortar.

The top grade of the precast concrete corbel section shall be set sufficiently below finished grade. Precast risers must be used when possible to adjust this grade. If precast risers cannot be used, then minimum brick adjustment as approved by the ENGINEER. Manhole frames shall be set on a bituminous mastic CONN seal or equivalent.

99.3.7.2.6.8. **Bitumastic Coating** – the entire exterior surface of all sanitary manholes shall be coated with 2 coats of an approved bitumastic material to produce a dry thickness of 0.07 (7mils) per coat.

99.3.7.2.7. **Connections to Existing Facilities**

99.3.7.2.7.1. **General Requirements** – the Contractor shall make all required connections of the proposed sanitary sewer into existing sanitary sewer facilities, where and as shown on the Drawings.

99.3.7.2.7.2. The cost of making connections shall be included with the unit price bid for the pipe, complete in place.

99.3.7.2.8. **Alteration and/or Reconstruction of Existing Structures**

99.3.7.2.8.1. **General Requirements** – the Contractor shall alter and/or reconstruct existing structures where shown on the Drawings, and/or as directed by the ENGINEER. In general, alterations shall be made with the same type of material used in the original construction unless otherwise indicated on the Drawings.

99.3.7.2.8.2. **Adjustment to New Grade and Alignment** – when casting on existing sanitary sewer structures that are to remain need to be adjusted to new grade and alignment, the castings shall be carefully removed and the walls of the structure reconstructed as required. The castings shall be cleaned and reset in an insert bituminous mastic CONN seal or equivalent to the new grade and alignment. Existing castings, which are broken damaged or otherwise unfit for incorporation in the new work, shall be replaced at the unit price bid.

99.3.7.2.8.3. **Removal of Portions of Walls of Existing Structures** – in all cases of alteration and/or reconstruction of existing structures, existing wall shall be removed to a point where the existing walls will provide sound and adequate foundation for the construction of new walls.

99.3.7.2.8.4. **Damage to Existing Structure and/or Pipe** – the Contractor shall exercise extreme care during such alteration and/or reconstruction so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at no cost to the Owner.

99.3.7.2.8.5. **Structure to be Cleaned** – upon completion of alteration and/or reconstruction of existing structures, all structures shall be cleaned of any accumulation of debris or foreign matter of any kind and shall be kept clean of such accumulation until final acceptance of the Work.

99.3.7.2.9. **Relocation and/or Abandonment of Existing Facilities** – the Contractor shall not abandon, disconnect, obstruct or otherwise interfere with the operation of an existing sewer facility until such time as adequate permanent or temporary substitute facilities have been constructed and placed in operation.

99.3.7.2.10. **Service Lines**

99.3.7.2.10.1. The Contractor shall install 45° wye branches in the sanitary sewer mains in all locations where building sewer services line connections are shown on the Drawings directly entering the sewer main. Connection of the sanitary sewer service lines shall be made into the wye branches by means of 45° bends. The connections shall be made thoroughly watertight, shall be placed under each connection to bear on undisturbed earth to firmly support the connection. At least thirteen (13) feet of the lateral pipe with a cap shall be placed beyond a wye branch on the main line.

99.3.7.2.10.2. The Contractor shall mark appropriately the location of each “Y” branch from the sewer to the surface of the ground.

99.3.7.2.10.3. The Contractor shall locate and keep a record of all opening and “Y” branches as located by measurement to the nearest downstream manhole. Such records shall be delivered to the ENGINEER during the progress of the Work.

99.3.7.2.11. **Tests**

99.3.7.2.11.1. **General Requirements** – the Contractor shall test the completed sewers, including manholes, for leakage, compaction and deflection as specified herein. The tests will be conducted as approved by the ENGINEER. The Contractor shall furnish all necessary equipment, materials and labor for performing the tests as specified.

The Contractor shall notify the ENGINEER at least 48 hours prior to the start of testing. Testing shall only be performed in the presence of the ENGINEER. Section of pipe tested prior to completion of the Project shall be subject to additional leakage tests, if warranted in the opinion of the Project.

99.3.7.2.11.2. **Procedure and Method of Testing** – all sewer lines shall be thoroughly flushed with water to obtain free flow through the lines. All obstructions shall be removed and all defects corrected prior to testing. The sewer lines shall be given the following tests:

99.3.7.2.11.2.1. **Lamping** – a flashlight or similar lighting device shall be projected into the end of each pipe entering each manhole. A visual observation shall be made from the next adjacent manhole. The pipe when laid and completed should not be accepted unless a full circle of light from the lamp is visible from the manhole to manhole, observations of less than a full pipe circle may be accepted provided the deflection is not in a vertical plane. Any deviation from perfect alignment shall be noted on the test report.

99.3.7.2.11.2.2. **Air Testing** – all gravity sewers shall be subject to a low pressure air test. The Contractor shall furnish all the necessary labor, equipment and material to perform the test. After flushing and removal of all obstructions, the sections of sewer line shall be tested from manhole to manhole. All openings, laterals, stubs, branches, wyes, tees and pipe ends shall be securely capped or plugged and adequately braced.

Air testing may be dangerous if, because of carelessness, a line is improperly prepared for testing. An improperly installed plug could cause a sudden explosion. No one shall be allowed in the manholes during testing.

The air shall be slowly supplied to the plugged pipe until the internal pressure reaches 5.0 p.s.i. for five (5) minutes.

Two minutes shall be allowed for a stabilization period before proceeding further.

When the pressure is stabilized at 5.0 p.s.i. the air hose from the control panel to the air supply shall be shut off or disconnected.

Additional pressures shall be applied to the above values to compensate for ground water pressures on the pipe at the rate of 0.5 p.s.i. per foot of water over the pipe.

Where L=Length of Pipe being tested.

If the time shown above for the designated pipe size elapses before the air pressure drops 1.0 psi the section undergoing the test shall have passed. The test may be discontinued once the prescribed time has elapsed even though the 1.0 psi drop has not occurred. If the section fails to meet these requirements, the Contractor shall repair or replace the materials and/or workmanship. The completed pipe installation shall then be retested until the requirements of this test are met.

99.3.7.2.11.2.3. **Deflection Tests** – after installation and final backfill all pipelines constructed of flexible materials shall be measured for vertical ring deflection by passing a test ball or “go no go” Mandrel gauge through them to demonstrate that the deflection is less than 5% of the diameter of the pipe. [Amended 4-7-08 by Ord. No. 1996]

99.3.7.2.11.2.4. **Weir Test** – sanitary sewer may also be required to be checked for actual infiltration by installation of a V-notch Weir at the lower terminus of the new work, or each section of new work. Measurements shall be made immediately following periods of extended rain or when the ground is saturated with water. The maximum infiltration permitted for the system shall be 200 gallons per inch of pipe diameter per mile of pipe per day. The sources of any infiltration shall be determined and corrected.

99.3.7.2.11.2.5. **Manhole Vacuum Test** – after installation, and preferably before backfill, manholes shall be tested for leakage by the air vacuum method. All lift holes shall be sealed. The pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer’s recommendations. A vacuum of 10 inches of mercury for 60 seconds shall be drawn and the vacuum pump shut off. With the valves closed the time shall be measured for the vacuum to drop to 9 inches. The manholes shall pass if the time is greater than 60 seconds for

48" diameter, 75 seconds for 60", and 90 seconds for 72" diameter manholes. If the manhole fails the initial test, necessary repairs shall be made with a water plug or approved equal while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained.

99.3.7.2.11.3. **Correction of Defective Work** – if leakage exceeds the specified amount, the Contractor shall at his own expense make the necessary repairs or replacements required to permanently reduce the leakage to within the specified limit, and the tests shall be repeated until the leakage requirement is met.

Any defects found in the system are to be repaired at the expense of the Contractor so as to conform strictly to the specifications. All repairs shown necessary by the tests are to be made, broken or cracked pipe replaced, all deposits removed, and sanitary sewer left true to line and grade and entirely clean, free from lumps of cement, protruding gaskets, bulkheads, etc., and ready for use before final acceptance by the TOWNSHIP.

99.3.7.2.12. **Cleaning and Repair**

99.3.7.2.12.1. The Contractor will be required to clean the entire sanitary sewer system of all debris and obstructions. This shall include, but not be limited to removal of all formwork form structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing sanitary sewers. All debris shall be removed from the system and disposed of with appropriate certification and disposal is required and will be performed by the contractor at no cost to the TOWNSHIP.

99.3.7.2.12.2. After the system has been cleaned, the Contractor shall thoroughly inspect the system and all repairs shown to be necessary shall be properly performed by Contractor. All work of cleaning and repair as specified herein shall be performed at the Contractor's expense.

99.3.7.2.13. **Final Inspection** – upon completion of the Work and before the final acceptance by the Owner, the entire sanitary sewer system shall be subject to a final inspection in the presence of the ENGINEER. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, leakage tests, restoration, and workmanship have been met.

99.3.7.2.13.1. **Test and Video Inspection** - shall be required of all newly constructed SANITARY SEWERS. [Added 4-7-08 by Ord. No. 1996; Amended 3-2-09 by Ord. No. 2019]

99.3.7.2.13.1.1. prior to acceptance by the TOWNSHIP as a PUBLIC IMPROVEMENT, all newly constructed SANITARY SEWERS and manholes shall be vacuum and air tested and shall pass a Mandrel test as described in §99.3.7.2.11. of this Chapter. [Amended 3-2-09 by Ord. No. 2019]

99.3.7.2.13.1.2. at least twelve (12) months after acceptance by the TOWNSHIP as a PUBLIC IMPROVEMENT and prior to release of the eighteen (18) month maintenance security, all SANITARY SEWERS must pass a video inspection, after which time the DEVELOPER shall provide one (1) hard copy of the printed video inspection logs and one (1) DVD recording of all data to the TOWNSHIP for review and approval. [Amended 3-2-09 by Ord. No. 2019]

99.3.7.2.13.1.3. all video inspection and rating for each SANITARY SEWER segment shall be in accordance with the specifications and rating system utilized by the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP).

99.3.7.2.13.1.4. all video inspection conducted must utilize the WinCan PACP version 7.2. inspection software or higher for review and inventory of the data.

99.3.7.2.13.1.5. all video inspection shall be conducted by a National Association of Sewer Service Companies (NASSCO) certified contractor and paid for by the DEVELOPER or the person or group responsible for installing the SANITARY SEWER.

99.3.7.3. **Materials** – the materials to be used in the construction shall be those indications on the Drawings and/or the Project Specifications.

99.3.7.3.1. **Sanitary Sewer Pipe, Fittings and Joints**

99.3.7.3.1.1. **Ductile Iron Pipe and Fittings (DIP)** – pipe shall be centrifugally cast in accordance with AWWA Specifications C 150 and C 151, latest revisions in 18 or 20 foot nominal lengths. The joint shall be of the push-on type which employs a single rubber gasket to effect the joint seal and utilize the lubricant recommended

by the manufacturer on all joint surfaces. The pipe shall have the following wall thickness:

Minimum Wall Thickness Ductile Iron Pipe		
<u>Diameter</u>	<u>Wall Thickness</u>	<u>AWWA Class</u>
6"	.25"	50
8"	.27"	50
10"	.29"	50
12"	.31"	50
14"	.36"	51
16"	.37"	51
18"	.38"	51
20"	.39"	51
24"	.44"	52

Fittings shall be short body in accordance with AWWA Specifications C 110, Class 250, and shall be furnished with Mechanical joints in accordance with AWWA Specifications C 111. All joints will be furnished complete with accessories consisting of cast iron glands, high-strength bolts and nuts, and rubber gaskets.

The manufacturer of the pipe shall furnish two Silicon Bronze Wedges for each length of pipe to be used in the pipe installation to provide a positive means if electrical conductivity across the pipe joint. All pipe fittings shall be completely coated inside and out with asphalt or approved sealer.

99.3.7.3.1.3. **Polyvinyl Chloride Pipe and Fittings (PVC)** – polyvinyl chloride pipe and fittings shall be if the best quality and shall conform to the requirements of ASTM Designation D-3033 or D-3034, with a standard dimension ratio of 35 for pipe sizes up to 15 inches. For pipe sizes from 18 inches to 27 inches the pipe shall conform to ASTM Designation F-679 with a standard dimension ratio of 35 and minimum wall thickness classification of T-1.

99.3.7.3.1.3.1. The pipe shall be stored on flat surfaces so that the barrel is evenly supported. The pipe shall be protected from the sunlight by an opaque material cover. The pipe shall be piled no higher than 4 feet in height and not dropped or dragged across sharp objects.

99.3.7.3.1.3.2. All pipe shall be subject to inspection at the factory, trench or other point of delivery by a competent inspector employed by the Township. The purpose if the inspection shall be to cull and reject pipe that, independent of the physical tests specified in ASTM Designation D-3033 or

D-3034, fails to comply with the requirements of this Specifications.

99.3.7.3.1.3.3. Joints shall conform in all respects to ASTM Designation F-477, ASTM Designation D-3212, and the pipe manufacturer's recommendation. Before any construction begins the Contractor shall inform the ENGINEER as to the type of joint that shall be used.

99.3.7.3.1.3.4. The Contractor shall provide manufactured fittings in all areas where fittings are required.

99.3.7.3.1.3.5. Each pipe and fittings shall be clearly marked containing the manufacturer's name, nominal size, the words "non pressure materials", designation "PVC", the ASTM Designation, and the SDR number.

99.3.7.3.1.3.6. The installed line shall meet a deflection requirement of less than 3 ½" by the use of a so called "go no go" gauge.

99.3.7.3.1.3.7. All pipe shall be laid in compliance with the proper ASTM Specification of the manufacturer's recommendation for installation which do not conflict with these standard specifications.

#### 99.3.7.3.2. **Manholes**

99.3.7.3.2.1. **Precast Manholes** – precast concrete manholes shall be used unless otherwise specified. Precast reinforced concrete manhole sections shall conform to the "Specifications for Precast Reinforced Concrete Manhole Sections," AASHTO Designation M-1999. Manholes top sections shall be cast with insert holed to receive anchor bolts.

Prior to fabrication, the Contractor shall submit four (4) sets of plans of the proposed precast structures to the ENGINEER for approval, along with design criteria and certification by the manufacturer that the structure will support the design load.

The minimum compressive strength of the concrete used for all precast structures shall be 4,000 psi.

Where steps are required in structures, steps shall be installed during the casting if the structures, aligned as specified herein. Joints in the

structures shall be tongue and groove joints, formed in such a manner so that either a mastic or rubber seal can be applied.

All structures shall have an identification number and manufacturer's name on each section.

Approval of precast structures shall relieve the Owner or Township of any additional costs for modification of openings due to line or grade changes, deletion of structures, relocation of structures, or addition or deletion of lines to be connected into the structures. And such additional cost shall be at the Contractor's expense.

99.3.7.3.2.3. **Manhole Frames and Covers** – shall be gray cast iron castings, conforming to the requirements of AASHTO Designation M-105, latest revisions, Class 30. The castings shall be true to pattern in form and dimensions as specified and shall be free from pouring faults, sponginess, cracks, blow holes and other defects that affect their strength and other characteristics for the intended use. All surfaces shall have a workmanlike finish. All frames shall have anchor bolt slots to match the manhole insert locations. All component parts shall fit together in a satisfactory manner and frames and covers shall be of non-rocking design so as to prevent rocking or rattling under traffic. Frames and covers that are warped or rocking will be rejected and shall be removed and replaced by the Contractor at no expense to the Township. Manhole lids must have a center hole.

99.3.7.3.2.4. **Concrete**—shall be Class A conforming to the requirements for concrete as specified herein under the Section entitled "Cement Concrete".

99.3.7.3.2.5. **Reinforcement**—shall be new billet stock deformed steel bars conforming to AASHTO Designation Grade 40. Steel wire fabric shall conform to AASHTO Designation M-55. Metal accessories, chairs, ties, and other items necessary for proper placement of reinforcing, shall be provided. Reinforcement shall be free from scale, oil, ice and structural defects and shall be stored so as to prevent contact with the ground.

99.3.7.3.2.6. **Mortar**—shall be composed of one (1) part Portland cement and two (2) parts sand by volume. Hydrated lime, not to exceed four (4) pounds of lime to each bag of cement, may be added if approved by the ENGINEER. Material requirements shall be as follows:

99.3.7.3.2.6.1. **Portland Cement**—shall conform to the requirements of AASHTO Designation M-85, Type II.

99.3.7.3.2.6.2. **Hydrated Lime**—shall conform to the requirements of ASTM C-6.

99.3.7.3.2.6.3. **Mortar Sand**—shall conform to the requirements of AASHTO Designation M-45, except that aggregate shall be no coarser than #8 sieve size.

99.3.7.3.2.6.4. **Water**—shall be clean and shall not contain any oil, acid, alkali, salts, vegetable matter, organic matter or other deleterious substances. Water shall be from a municipal system.

Hand mixing of mortar will be permitted only when the amount of mortar to be used makes machine mixing undesirable. When hand mixing is used, the ingredients must first be thoroughly mixed dry in a tight box, after which the proper quantity of clean water shall be gradually added and then the materials shall be hoed or worked until a uniform mixture is secured.

Admixtures may be added only with the prior written approval, and in the presence of the ENGINEER.

No greater quantity of mortar is to be prepared than is required for immediate use and it shall be worked over constantly with hoe or shovel until used. No mortar shall be retempered and none shall be used more than 1 ½ hours after mixing. All mortar mixture which remains upon stopping work shall be discarded.

99.3.7.3.2.7. **Ladder Rungs**—manhole ladder rungs shall be made of one of the following materials and shall meet the requirements of Deformed reinforcement bars, ASTM A 615M, Grade 400 (A615, Grade 60), coated with copolymer Polypropylene plastic that meets the requirements of ASTM D4101; Table PP; Group 3 Copolymer or Impact Modified; Class 2,3, or 4; any grades 1 through 9. (605-1 Pub 408)

99.3.7.3.2.7.1. Aluminum alloy 6061-T6 or 6005-T5 meeting the requirements of ASTM Designation B221.

All rungs shall be true to pattern, form dimensions, and free from pouring defects which would affect their strength.

Steps having pouring defects filled with putty or cement of any kind will be rejected.

### 99.3.8. **Cement Concrete**

#### 99.3.8.1. **Description**

##### 99.3.8.1.1. **Classes of Concrete**

99.3.8.1.1.1. **Class AA Concrete**—shall be air-entrained ready mixed concrete, 4,000 psi, 28 day compressive strength used for concrete pavement.

99.3.8.1.1.2 **Class A Concrete**—shall be air-entrained ready mixed concrete, 3300 psi, 28 day compressive strength for use in structures, curbs and sidewalks.

99.3.8.1.1.3 **Class C Concrete**—shall be air-entrained ready mixed, 2000 psi, 28-day compressive strength for use in miscellaneous construction.

99.3.8.1.1.4 **Class H.E.S.**—high early strength concrete shall be air-entrained ready mixed concrete, 4,000 psi, compressive strength for use in structures, curbs and sidewalks where early strength is desired.

99.3.8.1.1.5 All concrete shall conform to the requirements of PennDOT Publication 408, Section 704, and applicable sections relating to cement, aggregates and water.

#### 99.3.8.2. **Material Tests**

99.3.8.2.1. The supplier shall furnish copies of delivery tickets to the ENGINEER for each load of concrete as the delivery is made. The ticket shall indicate the batch weights and the mix design.

99.3.8.2.2. Test cylinders shall be made up for each truckload, properly marked and stored, then tested by an independent testing laboratory for 7-day and 28-day strengths. Certified copies of the test results shall be submitted promptly to the ENGINEER.

#### 99.3.8.3. **Method of Construction**

##### 99.3.8.3.1. **General**

99.3.8.3.1.1. In hot weather, the concrete temperature shall be kept below 90° F for one day.

99.3.8.3.1.2. When the air temperature is below 40° F, the mixing water shall be heated to a temperature not to exceed 150° F, and aggregates shall be freed from frost by injecting live steam into the pile before mixing. The use of accelerators shall not be used unless prior written approval is received from the ENGINEER. Heat water in excess of 90° F shall not come in contact with the cement.

99.3.8.3.1.3. Concrete shall be deposited within 30 minutes after mixing, as nearly as practicable, in its final position to avoid segregation due to rehandling or flowing.

99.3.8.3.1.4. Provide proper chutes, troughs and other devices to convey concrete to the various levels. In no case shall concrete be allowed to free fall or be deposited from a height that will separate the aggregates.

99.3.8.3.1.5. In placing concrete around reinforcement, care shall be taken to work the concrete well around and into thorough contact with the steel and not disturb the reinforcement. Mechanical vibrators shall be used to insure consolidation. Over-vibrating which may cause segregation shall not be permitted.

99.3.8.3.1.6. **Use of High Strength Concrete**—if the Contractor wishes he will be permitted the use High Early Strength Concrete. The location of the cement so used shall be throughout a unit of work or member of the structure. No additional compensation shall be allowed for its use unless so provided in the Proposal and Project Specifications.

99.3.8.3.2. **Curing**—concrete shall be protected from the sun and kept moist for at least 7 days. During this period, concrete shall be maintained above 70° F for at least 3 days or above 50° F for at least 5 days. Exposed concrete shall be kept thoroughly wetted during the first week and covered with polyethylene or insulation. Liquid membrane curing meeting the requirements of AASHTO Designation M-148, type I may be used upon approval of the ENGINEER.

99.3.8.3.3. **Finishing**—as soon as the face forms are removed, all fins and other projections shall be carefully removed and offsets leveled, and rubbed with carborundum where necessary. No plastering will be permitted after the concrete has set.

99.3.8.3.4. **Protective Coating for Concrete**

99.3.8.3.4.1. All cement concrete pavements, curbs, gutters, sidewalks, and other structures subject to salt damage shall be treated with a two-coat application of boiled linseed oil diluted with mineral spirits. The linseed oil shall meet the requirements of ASTM D-260, Type I or an approved alternative.

99.3.8.3.4.2. The first application shall consist of a mixture of equal volumes of linseed oil and mineral spirits applied with a pressure sprayer at the rate of one gallon per 40 square yards of surface.

99.3.8.3.4.3. After 24 hours a second application consisting of a mixture of 80% linseed oil and 20% of mineral spirits shall be applied at the rate of one gallon per 67 square yards of surface or at the appropriate rate.

99.3.8.3.4.4. No traffic shall be permitted on the treated surface for 6 hours, or until the surface is no longer oily.

#### 99.3.9. **Curbs and Sidewalks**

##### 99.3.9.1. **Description**

99.3.9.1.1. **Scope**—work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment necessary and required to install all of the curbs, sidewalks and related monolithic concrete construction as specified in accordance with the Drawings and the Project Specifications.

##### 99.3.9.2. **Construction Details**

###### 99.3.9.2.1. **General**

99.3.9.2.1.1. The Contractor shall be responsible for laying out and installing all curbs, walks and related items specified herein in accordance with the cross-sections, lines and grades as specified herein and shown on the Drawings or designated by the TOWNSHIP ENGINEER. All curbs, walks, and related items as specified which are not constructed to the proper section; or damaged by weather, grade or alignment shall be corrected by repair or replacement by the Contractor at no additional cost to the Owner/TOWNSHIP.

99.3.9.2.1.2. All concrete items as specified herein shall be constructed of Class AA Concrete in accordance with the requirements of the Section entitled “Cement Concrete”.

99.3.9.2.2. **Curbs**

99.3.9.2.2.1. **Concrete Curb (Cast-In-Place)**

99.3.9.2.2.1.1. **General Requirements**—concrete curb shall be cast in the place to proper size and shape and to the line and grade shown on the Drawings. The curbing shall be constructed using conventional forms and in segments separated by construction joints and expansion joints as specified herein.

99.3.9.2.2.1.2. **Forms**—forms shall be metal or acceptable planed and matched lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall conform to the curb cross-section shown on the Drawings and shall be carefully set to line and grade and thoroughly braced and secured in place so that there will be no displacement during placing of the concrete. All forms shall be thoroughly cleaned prior to reuse.

99.3.9.2.2.1.3. **Placing of Concrete**—prior to placing the concrete the subgrade shall be moistened and the contact surfaces of the forms shall be given a light coating of oil that will not discolor the concrete. Concrete shall then be placed in the form as near to its final position as practicable, struck off with a template, spaded to prevent “rock-pockets” or “honey-combing” adjacent to the forms and finished to a smooth even surface. The concrete may be compacted by mechanical vibrators.

99.3.9.2.2.1.4. **Expansion Joints**—vertical expansion joints shall be located approximately every 60 feet or approved alternative and shall be so arranged that they shall match expansion joints in any adjacent concrete pavements and sidewalks. Expansion joints shall also be installed at the tangent points of all radius curbs and adjacent to all structures. Expansion joints shall be constructed vertical, plumb and at right angles to the face of the curb. They shall be ½ inch in width and formed with pre-molded bituminous joint filler (Flexcell or equal) cut to conform to the cross-section of the curb.

99.3.9.2.2.1.4. **Construction Joints**—vertical construction joints shall be located approximately 10 feet being equally spaced between expansion joints. The length of these curb

segments may be varied slightly foreclosures but in no case shall they be less than 8 feet. Construction joints shall be vertical, plumb and at right angles to the face of the curb and shall be formed by approved method that will provide complete separation of the curb segments during placing of the concrete.

99.3.9.2.2.1.5. **Curb Depressions**—where specified on the plans, the straight type curbs shall be depressed to accommodate driveways and handicap ramps or curb to be set flush to inlet hoods, where applicable. All depressions must meet ADA standards. See handicap ramp standards.

99.3.9.2.2.1.6. **Finishing**—forms shall be left in place until the concrete has sufficiently hardened so that they can be removed without injury to the curb. Upon removal of the forms, the exposed faces of the curb shall be immediately rubbed to a uniform surface. Rubbing shall be performed by experienced and competent concrete finishers. No plastering will be permitted.

99.3.9.2.2.1.7. The finished surface of curbs shall receive an approved treatment as specified in Section 99.3.8.3.4 of these Specifications.

99.3.9.2.2.2. **Concrete Curb (Slip-Formed)**

99.3.9.2.2.2.1. **General Requirements**—slip formed curb shall be as shown in detail on the Drawings and may be used instead of Concrete Curb (cast-in-place) with specific written approval of the ENGINEER.

99.3.9.2.2.2.2. **Installation**—curb shall be installed true to line and grade and shall be securely fastened to the pavement in accordance with the Detail shown on the Drawings. The curb paver shall be properly supported and weighted during operation along the edge of the pavement and shall be guided along string or chalk lines to maintain the proper alignment and level of the completed curb.

99.3.9.2.2.2.3. Any portion of the completed curb, which is not satisfactory compacted, or show signs or sagging, cracking, or distortion or does not conform to the required lines, grades or cross section for any reason and which cannot be satisfactorily repaired during construction, shall be removed and replaced at no additional cost to the Owner.

99.3.9.2.2.2.4. The water content of the concrete mix shall be control led to provide a maximum slump of 1 ½ inches.

99.3.9.2.2.2.5. As the curb is extruded, the curb shall be rubbed with wood floats to obtain a uniform finish free of defects or blemishes.

99.3.9.2.2.2.6. Expansion and contraction joints shall be set in conformance to the requirements of cast-in-place curbs as specified above.

99.3.9.2.2.2.7. The finished surfaces of curbs shall receive a linseed oil treatment as specified in Section 8.304 of these Specifications.

99.3.9.2.2.3. **Asphaltic Wedge Curbs**—asphaltic wedge curbs shall be as detailed on the plans. Wedge curb base, binder and wearing course shall be placed integral with the pavement construction. Sufficient base shall be provided behind the curb to adequately support the wedge curb.

99.3.9.2.2.4. **Asphaltic Concrete Curb**

99.3.9.2.2.4.1. **General Requirements**—asphalt curbing shall be constructed by the use of an approved self-propelled extruding curb machine equipped with a material hopper, distributing screw and curb forming device capable of placing the bituminous mixture to the required lines, grades and proper curb cross-section. Prior to the placement of any curb the Contractor shall submit a detail of the cross-section of the curb mold that he proposes to use to the ENGINEER for approval or curb to be set flush to inlet hoods, where applicable.

99.3.9.2.2.4.2. **Materials**—asphaltic concrete curb shall be composed of dense, hot mix asphaltic concrete with a aggregate fine enough to furnish a smooth surface yet firm enough to resist tire pressure when completely set. Asphaltic concrete grading and mix composition shall be as follows:

Aggregate Mixture	
<u>Sieve Size</u>	<u>Percent Passing</u>
½"	100
3/8"	85-100
No. 4	60-85

No. 10	45-60
No. 40	20-45
No. 80	6-20
No. 200	0-5

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Material and Temperatures

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Asbestos	2-3%
Asphalt Cement	6-7.5%
Mix Temperature	325-375° F

Alternative materials may be used is approved by the ENGINEER.

The percentage shown above are the limits of the amount combined aggregate (including filler) passing each sieve, size, by weight.

Asphaltic materials shall be subject to tests outlined in Section 99.3.10.2.11. of these Specifications.

99.3.9.2.2.4.3. **Surface Preparation**—when curbing is to be placed on existing bituminous pavements, Portland cement concrete pavements or newly laid bituminous pavements which have been in place more than 24 hours, the surface on which the curb is to be placed shall be swept and cleaned, thoroughly dried, and, immediately prior to the placement of the curb, the surface to be occupied by the curb shall be given an application of tack coat material beyond the area to be occupied by the curb. Recently placed bituminous concrete pavements which have been placed less than 24 hours prior to placement of the curb need only be thoroughly swept and cleaned.

99.3.9.2.2.4.4. **Placing and Compaction**—the hot bituminous mixture shall be placed in the hopper of the curb paver without segregation and extruded through the mold form to provide the proper compaction and surface texture.

The curb paver shall be properly supported and weighted during operation along the edge of the pavement and shall be guided along string or chalk line to maintain the proper alignment and level of the completed curb.

Any portion of the completed curb, which is not satisfactorily compacted, or shows signs of sagging, cracking or distortion or does not conform to the required lines, grades or cross section for any reason, and which cannot be satisfactorily

repaired during construction, shall be removed and replaced at no additional cost to the Owner/Township.

99.3.9.2.2.4.5. **Joints**—bituminous curb construction shall be continuous operation in one direction only, to eliminate frequent joints. When placing of the curb is discontinued for a length of time that permits the mixture to become chilled, the curb shall be cut in a true vertical plane and the exposed end painted with a thin uniform coat of hot asphalt cement just prior to placing the fresh curb mixture against the previously constructed curb to insure a continuous bond.

99.3.9.2.3. **Sidewalks**

99.3.9.2.3.1. **Concrete Sidewalks**

99.3.9.2.3.1.1. **General Requirements**—concrete sidewalks shall be constructed of Class A Concrete in the location and to the dimensions and cross section shown on the Drawings as outlined in the specifications. The slope of the sidewalks shown shall be generally as shown on the Drawings, but in the case of transitions or warp sections, the sidewalk shall be constructed to give an effective combination of proper drainage and good appearance. In the event of doubt regarding the slope of any sidewalk, the Contractor shall set appropriate grade stakes and verify the slope with the ENGINEER before such sidewalk is placed.

A three (3) foot grass area shall be installed, unless otherwise directed by the ENGINEER.

99.3.9.2.3.1.2. **Preparation of Subgrade**—the subgrade for sidewalks shall be properly prepared by removal of any undesirable material and replaced with suitable granular material, thoroughly tamped. Exceptionally hard natural earth shall be fine graded and thoroughly compacted prior to placement of any concrete. Where called for on the Drawings, granular material shall be placed as a sub base for the sidewalk. Sidewalks shall not be placed on frozen subgrade or sub base, and materials containing frost or ice shall be rejected.

99.3.9.2.3.1.3. **Forms**—forms shall be metal or acceptable planed and matched lumber, straight and free from warp or other irregularities that will adversely affect the installation. Forms shall be carefully set to lie and grade with the required

cross slopes to provide for proper drainage and shall be thoroughly braced and secured in place so that there will be no displacement during placing of the concrete. All forms shall be thoroughly cleaned prior to reuse and just prior to placement of the concrete, the portion of the forms in contact with the concrete shall be given a light coat of oil that will not discolor the concrete.

99.3.9.2.3.1.4. **Placing of Concrete**—immediately prior to placing the concrete, the subgrade shall be thoroughly dampened so that it is moist throughout, but without puddles of water. Concrete shall be placed in the forms as near to its final position as practicable. Precautions shall be taken to not overwork the concrete while it is still plastic. Concrete in which an excess of water and fine material have been brought to the surface will be rejected. The concrete shall be placed in the forms and tamped and spaded just enough to compact it firmly. The concrete may be compacted by means of mechanical vibrators.

99.3.9.2.3.1.5. **Expansion Joints**—expansion joints, consisting of premolded bituminous joint filler (Flexcell or equal) ½ inch thick and as deep as the full depth of the walk, shall be placed at intervals of twenty (20) feet as directed or less longitudinally along walks and whenever the walk abuts a building, concrete curb, other sidewalk, pole, utility casting, lighting standard, or any other rigid object. The joint filler shall be set ¼ inch below the finished surface of the concrete. Expansion joints shall match the location of similar joints in curbs and adjacent structures.

99.3.9.2.3.1.6. **Handicap Ramps**—ramps for the handicapped shall be installed and constructed in conformance with the details on the Drawings and adhere to all current ADA standards. The sub-base shall be formed to match the grade of the handicapped ramp to assure the design thickness of the base course and concrete.

99.3.9.2.3.1.7 **Concrete Steps**—concrete steps shall be constructed of Class A air-entrained concrete and shall conform to the Contract Plan details. Riser faces shall be smooth and treads shall be finished to the degree of roughness ordered. No plastering will be permitted in the finishing process after the forms have been removed. Pipe railings shall be painted in conformance with the Contract Plans or Project Specifications.

99.3.9.2.3.1.8. The finished surface shall receive a linseed oil treatment as specified in Section 99.3.8.3.4 of these Specifications.

99.3.6.2.3.1.10. **Sidewalks/Through Driveways** – Sidewalks shall be constructed through with minimum thickness of five (5) inches with appropriately reinforced pg. 200 and 206 illustrations.

99.3.9.2.4. **Backfilling Behind Curbs and Sidewalks**—upon completion of curbs and sidewalks, the berms and/or shoulder shall be backfilled with clean earthen materials to the design slopes and rolled or tamped. Due care shall be taken to prevent damage to the concrete. Topsoil shall be used for the upper 6 inches of backfill, and the area seeded as specified in the Project Specifications.

## 99.3.10. **Pavements**

### 99.3.10.1. **Description**

#### 99.3.10.1.1. **Scope**

99.3.10.1.1.1. Work under this Section of the Specifications shall consist of providing all labor, plant, material and equipment to install all of the pavements in accordance with the Contract plans. Work shall include, but not be limited to:

99.3.10.1.1.1.1. Installation of all bituminous concrete pavements consisting of sub-base, base and bituminous wearing surface and including all associated items and operations necessary and required to complete the pavement installation.

99.3.10.1.1.1.2. Installation of all portland cement concrete pavements consisting of sub-base and reinforced concrete pavement, including all associated items and operations necessary and required to complete the pavement installation.

99.3.10.1.1.1.3. Preparation of subgrade to include fine grading compaction and proofrolling.

99.3.10.1.1.1.4. Installation of bituminous concrete overlays over existing pavements, including surface preparation, truing and leveling pavement, tack coating and all other

associated items and operations necessary and required to complete the installation.

99.3.10.1.1.1.5. All necessary and required line cutting of existing pavements.

99.3.10.1.1.1.6. All formwork, finishing, curing and testing necessary and required for the installation of pavements.

99.3.10.1.1.1.7. Reconstruction of existing roadways.

99.3.10.1.1.1.8. Materials Testing and Certifications.

99.3.10.1.1.2. Work under this Section shall also include the installation of temporary bituminous pavements over trenches and/or excavations in existing paved areas and the permanent replacement of pavement over these trenches and/or excavations.

99.3.10.1.2. **Pavements within Public Highways**

99.3.10.1.2.1. Work in or adjacent to State Highways shall be in conformance with PennDOT Standards and the conditions imposed by the Highway Occupancy Permits.

99.3.10.1.2.2. Work in or adjacent to County Highways shall be in conformance with the County Standards and the conditions imposed by the Highway Occupancy Permit.

99.3.10.1.3. **Work Specified Under Other Sections**--The following related work is specified under other Sections:

99.3.10.1.3.1. Site Preparation

99.3.10.1.3.2. Excavation and Embankment

99.3.10.1.3.3. Trench Excavation and Backfill

99.3.10.1.3.4. Curbs and Sidewalks

99.3.10.1.3.5. Traffic Control Devices

99.3.10.2. **Construction Details**

99.3.10.2.1. **General**

99.3.10.2.1.1. The Contractor shall install all pavements as specified in the locations and to the grades as shown on the Drawings. Materials, methods of construction and type and thickness of pavement courses shall be as shown on the Drawings and as specified herein.

99.3.10.2.1.2. Materials and construction details for bituminous pavements, bases and subbases shall conform to the Pennsylvania Department of Transportation Standard Specification for Construction and Materials, latest issue.

99.3.10.2.1.3. The Contractor shall be responsible for laying out and installing all pavements to the proper cross sections and in accordance with the lines and grades as specified herein and shown on the Drawings. Pavements which are not constructed to the proper grade and alignment shall be corrected by repair or replacement by the Contractor and at no additional cost to the Owner/Township.

99.3.10.2.2. **Preparation of Subgrade**

99.3.10.2.2.1. **General Requirements**--prior to the start of paving operations, the subgrade surface shall be prepared by filling in wheel ruts, erosion and all other ground disturbances regardless of the cause, and the ground surface shall be fine graded so that after compaction the subgrade surface will be at the proper elevation (+.05 foot) to accommodate the pavement structure.

99.3.10.2.2.2. **Fine Grading**--fine grading of the subgrade shall be performed in sections, working the equipment perpendicular to the contours and constructing the respective valley and ridges in accordance with the Drawings. Particular care shall be exercised with the grades of the crowns and the valleys, which lead to the catch basins. Fine grading of the roadways shall be performed parallel to the centerline, observing the profiles, crown and cross-sections shown on the Drawings. Fine grading shall not be performed when the subgrade is frozen or excessively wet.

99.3.10.2.2.3. **Compaction**--fine grading of the subgrade shall be accomplished by proper compaction to the extent that the upper 12 inches of the subgrade shall have a density not less than that as specified under the Section entitled "Excavation and Embankment." Compaction shall be performed by means of a roller weighing not less than 10 tons or other approved compaction equipment.

99.3.10.2.2.4. **Proof-Rolling**--immediately prior to the start of paving operation, the Contractor shall proof roll the subgrade in the

presence of the ENGINEER. If, in the opinion of the ENGINEER, the subgrade is not suitable for support of the pavement structure, measures shall be taken by the Contractor to correct the subgrade deficiencies at no cost to the Owner.

99.3.10.2.2.5. **Subgrade Approval**--the ENGINEER must approve the subgrade prior to placement of the initial pavement course. Installation of any or all portions of the pavement without subgrade approval by the ENGINEER is performed at the Contractor's risk.

99.3.10.2.2.6. **Protection of Approved Subgrade**--approval of the subgrade by the ENGINEER shall not relieve the Contractor of his responsibility to protect the subgrade from damage caused from excessive moisture, rutting from trucks or heavy equipment or from any other cause, and any damage occurring to the subgrade either before or during paving operations shall be corrected at the Contractor's expense.

99.3.10.2.3. **Preparation for Pavement Installation**

99.3.10.2.3.1. **Utility Structures and Appurtenances**-- after the subgrade and/or existing pavements surfaces have been prepared as specified herein, the Contractor shall check all frames, covers, grates, water value boxes and all other miscellaneous castings that are located in the proposed pavement areas to insure that all such items have been accurately positioned and set to the proper slope and elevation. All covers and grates must be to finished pavement surface. No depressions or mounds will be permitted in the pavement to accommodate inaccuracies in the setting of these appurtenances. All corrective work that may be necessary shall be performed at the Contractor's expense.

99.3.10.2.3.2. **Meeting Existing Pavements**--where new pavements are to meet existing pavements (except as specified herein under Bituminous Concrete Overlays), the Contractor shall line cut the existing pavements with approved pneumatic, saw cutting or mechanical cutting tools so that there will be a vertical butting surface between the old and new pavements. There shall be a 1 foot offset in each pavement course to permit each successive course to overlap the lower existing course. Line cutting of existing pavements shall be along neat, straight and even lines, and shall be performed in such a manner so as not to damage the adjacent pavement, which is to remain. The ENGINEER shall approve the acceptability of the line cutting device and the method of operation, and his decision shall be final.

Unless specified otherwise or directed by the ENGINEER, the following procedures shall be used:

99.3.10.2.3.2.1. **Widening or Extension of Existing Bituminous Pavements**--line cut by approved method for the full depth of the pavement prior to placement of any new pavement. The existing bituminous surface shall be trimmed to a neat true line with straight vertical edges free from irregularities for a minimum depth of 1 ½ inches, and the trimmed edges shall be treated with a light coating of asphaltic cement or asphaltic emulsion immediately prior to the installation of the new abutting bituminous concrete surface course to provide a bond between the old and new pavement. The new pavement surface shall be finished flush with the adjacent pavement.

99.3.10.2.3.2.2. **Pavement Replacement in Existing Bituminous Pavements**—lines shall be saw cut in accordance with the requirements specified herein for widening and extension of existing bituminous pavements. Line cutting for pavement replacement over trenches shall be parallel to the centerline of the trench; line cutting for pavement replacement at manholes, catch basins or other underground structures, test holes, etc., shall be in a square or rectangular configuration. For all types of pavements replacements, line cutting encompasses the disturbed area and includes the required undisturbed pavement shelf as specified herein.

99.3.10.2.3.2.3. **Bituminous Concrete Overlays**—cut a keyway no less than 24" wide by approved method where the new pavement is to meet the existing pavement and around inlets and manholes. The existing bituminous surface shall be trimmed to a neat true line with straight vertical edges free of irregularities for a minimum depth of one and one half (1 ½) compacted inch. Sufficient pavement shall then be removed to provide a minimum one and one half (1 ½) compacted inch thickness of bituminous concrete overlay in the area where the new pavement is to abut the existing pavement. Immediately prior to the placement of the bituminous concrete overlay the trimmed edges of the existing pavement shall be treated with asphaltic emulsion to bond the new pavement to the old pavement. The new pavement surface shall be finished flush with the adjacent pavement.

99.3.10.2.3.3. **Vertical Surfaces in Contract with Bituminous Mixtures**—all vertical surfaces of curbs, structures, gutters and existing pavement in contract with new bituminous mixtures shall be painted with a uniform coating of an approved bituminous emulsion or priming material. Extreme care shall be exercised in the application of this material to prevent splattering or staining of surfaces that are to remain exposed. Work that is stained as a result of the Contractor's operations shall be repaired and/or replaced at the Contractor's expense.

99.3.10.2.4. **Aggregate Base Course**

99.3.10.2.4.1. The base course for bituminous pavements shall be constructed on a properly prepared subgrade and/or subbase and as shown on the Drawings and Standards of Construction and as specified herein.

99.3.10.2.4.2. **Materials**—materials shall conform to the applicable requirements of the Pennsylvania Department of Transportation (PennDOT) Publication 408, current edition, with specific reference to the following:

Section 203—Excavation

Section 350—Subbase

Section 703—Aggregate

Section 720.2—Water

Section 721—Calcium Chloride

99.3.10.2.4.2.1. **Course Aggregate**—shall be Type “A” stone AASHTO No. 1 or No. 3.

99.3.10.2.4.2.2. **Fine Materials**—shall be Type “A” stone AASHTO No. 10 or PennDOT No. 2A.

Stone having unsatisfactory cementing qualities may be used, provided limestones fines in an amount of 20% are blended with the material.

99.3.10.2.4.3. **General Requirements**

99.3.10.2.4.3.1. Build up and compact shoulders for full width, to or above the elevation of each layer of base course, prior to placing base course; or build up and roll shoulders simultaneously with compaction of each layer.

99.3.10.2.4.3.2. Areas will be marked where base course is required for existing pavement replacement. Remove pavement in these areas to neat lines, as specified in Section 203 or PennDOT Publication 408.

99.3.10.2.4.3.3. In areas where spreading and compacting with mechanical equipment is impractical, spread and compact by another acceptable method.

99.3.10.2.4.3.4. If base course material is placed on existing pavement as an overlay or build up, construct in compacted layers.

99.3.10.2.4.3.5. If subgrade or subbase material become mixed with the base course, remove the mixture; reshape and recompact the subgrade and/or subbase; reconstruct the unsatisfactory base course area.

99.3.10.2.4.3.6. Use calcium chloride only when and as directed.

99.3.10.2.4.4. **Initial Layer of Fine Material**—spread an initial layer of fine material uniformly over the subgrade, subbase or existing pavement as a bed and filler; spread to a depth of 2 inches on subgrade, or 1 inch on subbase or existing pavement. Do not place this initial layer of fine material on wet, frozen or unsuitable subgrade or subbase.

99.3.10.2.4.5. **Construction Method I**

99.3.10.2.4.5.1. Use this method when compacting with rollers only.

99.3.10.2.4.5.2. If the base course is more than 8 inches in compacted depth, construct in 2 or more layers of approximately equal depth, with no layers less than 4 inches nor more than 8 inches in depth.

99.3.10.2.4.5.3. Spread uniformly on the initial layers of fine material to full width, unless otherwise specified. In area inaccessible to spreading equipment, spread materials directly from trucks. Remove segregated material and replace with well-graded material. Do not spread the material more than the distance completed in an average day's work ahead of choking and compacting.

99.3.10.2.4.5.4. Test each layer of material for surface irregularities, as specified in Section 99.3.10.2.4.7.

99.3.10.2.4.5.5. On normal crown section, begin rolling on the low side and progress to the high side.

99.3.10.2.4.5.6. Install string lines with ample supports, offset along each side to control the elevation and depth of the base course. Maintain string lines until the base course is completed and the deficiencies have been corrected.

99.3.10.2.4.5.7. Roll parallel with the roadway centerline, uniformly lap each preceding track, cover the entire surface with the rear wheels, and continue until the material does not creep or wave ahead of the roller wheels.

99.3.10.2.4.5.8. Place red flags at the initial limits or compacted coarse material completed. The flags will be moved ahead as additional material is compacted. Do not apply filler to the coarse material outside of the flag marked sections.

99.3.10.2.4.5.9. **Application of Fine Material**—after thoroughly compacting coarse material, spread material uniformly over the surface with spreading equipment, to assure filling voids. In areas inaccessible to equipment spreading with a square-edged shovel may be allowed; spread in a sweeping motion alternatively in opposite directions, until the voids are filled. Do not end-dump the material directly on the surface of the coarse material. Immediately following the spreading, sweep and roll the material until remaining voids in the coarse material are filled and the base course is thoroughly compacted and set. Use brooms attached to the roller and hand brooms. Loosen and scatter excess fines formed in piles or cakes upon the surface.

99.3.10.2.4.5.10. Spread and roll the material in sections of not less than 150 feet nor more than 1,000 feet in length, unless otherwise directed.

99.3.10.2.4.5.11. **Compacting and Bonding**—begin rolling the sides and progress as specified above. Cover the entire surface with the rear wheels, applying additional fines where necessary to fill voids, and continue rolling until the base course is thoroughly compacted and set.

99.3.10.2.4.5.12. After completion of spreading and rolling of fines, sprinkle with water and roll the surface of single layer construction or roll the surface of each layer of multi-layer construction. Perform diagonal and cross rolling as required or directed. Continue the sprinkling and rolling, applying additional fines until voids are filled and a slight wave of grout forms in front of the roller wheels. Use roller attached brooms and hand brooms to distribute the grout uniformly, filling the voids. Allow the rolled section to dry before proceeding with the surface course. Sprinkle and reroll the surface on succeeding days, as required, to thoroughly bond and to provide a satisfactory base course. The ENGINEER will determine the quantity of fines and water required to produce a smooth, hard monolithic surface.

99.3.10.2.4.5.13. Sprinkle water, using acceptable methods.

99.3.10.2.4.6. **Construction Method II**

99.3.10.2.4.6.1. Use this method when compacting with rollers and Vibratory equipment.

99.3.10.2.4.6.2 If the base course is more than 10 inches in compacted depth, construct in 2 or more layers of approximately equal depth, with no layer less than 5 inches nor more than 10 inches in depth.

99.3.10.2.4.6.3. Spread the coarse material as specified in Section 99.3.10.2.4.5.3 above.

99.3.10.2.4.6.4. Immediately after making surface corrections to the coarse material, compact, using vibratory equipment. Roll the layer, as specified in Section 99.3.10.2.4.5.5 above.

99.3.10.2.4.6.5. **Application of Fine Material**—after the coarse material has been set and keyed by vibration and rolling, spread fine material uniformly over the surface in an amount equal to about ½ of that required to fill the voids in the coarse material. Operate the vibrator over the surface so the fines settle into the voids. Spread and vibrate the remaining fines in one or more applications to satisfactory fill the voids; however, do not cause flotation of the coarse aggregate. Use manual methods to fill areas not completely filled by vibration.

99.3.10.2.4.6.6. **Compacting and Bonding**—after completing the vibration of the fine material, sprinkle the surface with water and roll. Continue the operation, as specified in Sections 99.3.10.2.4.5.11 and 99.3.10.2.4.5.12 above.

99.3.10.2.4.7. **Tests**

99.3.10.2.4.7.1. Use a template cut to the required cross section of the finished base coarse. Equip the templates with metal or other vertical extensions attached to each end, so the bottom of the template will be at the elevation of the top of the base coarse. Test the cross section for surface irregularities at intervals of not more than 25 feet.

99.3.10.2.4.7.2. Use a 10 foot straightedge to test for longitudinal irregularities in the surface of the base coarse. Hold the straightedge parallel to the road centerline in contact with the surface. Move the straightedge from one side of the base course to the other. Advance along the base course in 5 foot increments.

99.3.10.2.4.7.3. Correct all surface irregularities exceeding ½ inch by loosening the surface and removing or adding material as required. Compact the corrugated area and surrounding surface by rolling.

99.3.10.2.4.7.4. **Tests for Depth**—cut or dig one test hole to the full depth of the completed base coarse, where directed, for each 3,000 square yards or less. The ENGINEER will measure the depth of the base course. The initial bed and filler layer of the fine material is considered part of the base course for determining the final compacted depth. Remove and replace any area in which the depth is deficient by ½ inch or more. Additional test holes may be required, if directed, to determine the limits of replacement areas. After the depth has been measured, backfill test holes with acceptable material and compact.

99.3.10.2.4.7.5.

99.3.10.2.5. **Bituminous Concrete Pavements**

99.3.10.2.5.1. **General Requirements**—the Contractor shall construct bituminous concrete pavements upon a properly prepared

subgrade, in conformance with lines, grades, thickness and typical sections shown on the Drawings and specified herein.

99.3.10.2.5.2. **Materials and Construction Details**—materials and construction details shall conform to the applicable requirements of the Pennsylvania Department of Transportation (PennDOT) Publication 408, with specific reference to the following:

- 99.3.10.2.5.2.1. Section 305 - Bituminous Concrete Base Course
- 99.3.10.2.5.2.2. Section 420 - Bituminous Wearing Course ID-2
- 99.3.10.2.5.2.3. Section 421 - Bituminous Binder course ID-2
- 99.3.10.2.5.2.4. Section 422 - Bituminous Wearing Course FJ-1C
- 99.3.10.2.5.2.5. Section 424 - Bituminous Wearing Course ID-3
- 99.3.10.2.5.2.6. Section 703 - Aggregates

99.3.10.2.5.3. The course aggregate used in the bituminous wearing course shall have a Skid Resistance Level (SRL) designation of “H” or better, and be supplied from sources approved for this classification as defined and listed in PennDOT Bulletin No. 14.

99.3.10.2.5.4. All edges of the new pavement, including around street castings and along curbs, shall be sealed with a bituminous sealant, AC-20 or approved equal.

99.3.10.2.5.5. **Two Phase Paving**—prior to placing of the second phase wearing surface course, the existing surface shall be broomed free of all foreign and loose material by sweeping with a power broom. If, in the opinion of the ENGINEER, the results of brooming are not adequate, the roadway shall be flushed with water and again power broomed. This procedure shall be repeated until satisfactory results are obtained. Any visible failure in the existing roadway shall be corrected by methods to be approved by the ENGINEER. Around storm inlets, 36” wide keyways shall be cut.

The second phase wearing surface shall be one and one half (1 ½) inch of ID-2 surface course, constructed in accordance with these specifications and tapered into storm inlets.

#### 99.3.10.2.6. **Bituminous Concrete Overlays**

99.3.10.2.6.1. **General Requirements**—the Contractor shall place a bituminous concrete overlay over existing pavement, on a properly

prepared surface, in conformity with the lines, grades, thickness and typical sections shown on the Drawings and as specified herein. Feathering of the overlay to meet existing pavements shall not be permitted.

99.3.10.2.6.2. **Cleaning existing Pavement**—the existing pavement shall be cleaned by the use of hand brooms or mechanical sweepers of approved type. All loose material removed from the pavement surface shall be disposed of off site.

99.3.10.2.6.3. **Depression in existing Pavement**—all ruts and depressions in the existing pavement shall be swept clean by use of hand brooms until all loose material has been removed. The ruts and depressions shall then be filled with hot mix bituminous concrete leveling course to the general level of the adjacent pavement surface, and thoroughly compacted by approved mechanical means.

99.3.10.2.6.4. **Joints and/or cracks in Existing Pavement**—all joints in existing concrete pavements and all larger cracks in bituminous pavement (1/2" wide or larger) shall be thoroughly cleaned to a depth of 1 inch and replaced with a sand and asphalt grout.

99.3.10.2.6.5. **Truing and Leveling Existing Pavements**—the existing pavement surface shall be brought to a uniform grade and cross section where and as specified. The surface of the existing pavement shall be brought to the same transverse slope and longitudinal cross section as the finished pavement section using minimum variable thickness from 1½ inches to 2 inches; a dense binder course shall be used; and for thickness greater than 4 inches, and approved base course mix shall be used.

99.3.10.2.6.6. **Tack Coat**—the existing pavement surface shall be thoroughly cleaned then treated with an application of bituminous material to satisfactorily bond the old and new surfaces, all in conformance with Section 460 of PennDOT Publication 408 or current edition.

99.3.10.2.6.7. **Joint Sealing**—all edges of the new pavements, including around street castings and along curb, shall be sealed with a bituminous sealant, AC-20 or approved equal.

99.3.10.2.7. **Temporary Pavement**

99.3.10.2.7.1. **General Requirements**—the Contractor shall install temporary pavement in areas where existing pavement has been

disturbed due to his operations. This pavement shall be constructed after the excavation has been backfilled and properly compacted.

Unless otherwise specified, the construction of the temporary pavement shall consist of no less than a two (2) inch compacted course of hot-mix bituminous concrete.

99.3.10.2.7.2. **Spreading and Rolling** –After spreading, the material shall be rolled by means of a well-balanced roller weighing not less than ten (10) tons. In all places not accessible to the roller, the material shall be thoroughly compacted by approved mechanical tampers. The finished surface of the temporary pavement shall be flush with the adjacent pavement surface.

99.3.10.2.7.3. **Maintenance** – The temporary pavement shall be maintained by the contractor until such time that the final settlement of the trench shall have taken place. Any settlement taking place will be repaired by the Contractor at his expense by furnishing, spreading and rolling additional material over that previously laid. The Contractor shall continue this maintenance until such time that final settlement of the trench has occurred and that the trench is in readiness for the placement of the permanent surface.

#### 99.3.10.2.8. **Permanent Pavement Replacement**

99.3.10.2.8.1. **General Requirements** – The Contractor shall replace disturbed pavement to the lines and grades shown on the plans or specified herein. The existing pavement shall be line cut with suitable tools.

99.3.10.2.8.2. **Replacement of Temporary Pavements** – In areas where a temporary pavement has been placed, the Contractor shall remove the temporary pavement to the subgrade line shown on the Drawings or as specified. He shall then fine grade the subgrade to the proper elevation and compact it as described herein under ‘Preparation of Subgrade.’”

99.3.10.2.8.3. The Contractor shall excavate a shelf to provide a bearing area on all sides for the new pavement. The width of said shelf shall be as shown on the Drawings.

99.3.10.2.8.4. All edges of the pavement, including around street castings, and along curbs, shall be sealed with a bituminous sealant, AC-20 or approved equal.

99.3.10.2.9. **Seal Coat**--The existing surface shall be thoroughly cleaned, then treated with an application of bituminous material and coarse aggregate in conformance with Section 470 of PennDOT Publication 408 or current edition. All inlets and street castings shall be covered to avoid adhesion of the seal coat to them.

99.3.10.2.10. **Slurry Seal Treatment**--The existing surface shall be thoroughly cleaned, then treated with a bituminous slurry seal course in conformance with Section 482 of PennDOT Publication 408 or current edition. All inlets and street castings shall be covered to avoid adhesion of the slurry seal treatment to them.

99.3.10.2.11. **Materials Tests**

99.3.10.2.11.1. All materials used in permanent pavement construction shall be subject to testing and certifications as required by PennDOT procedures and regulations. All tests shall be performed by the Contractor, his suppliers or independent testing laboratories, at no cost to the Owner, if required by the ENGINEER.

99.3.10.2.11.2 Testing shall include, if required by the ENGINEER, but not be limited to:

99.3.10.2.11.2.1. **Aggregate** - Supplier's certifications, plus on grab sample per 10,000 tons to be tested by an independent laboratory.

99.3.10.2.11.2.2. **Bituminous Materials** – Daily plant certification, plus one grab sample per day for each type of material used for an extraction test by an independent testing laboratory. Additional grab samples may be required throughout the day of installation at the discretion of the inspector.

99.3.10.2.11.2.3. **Completed Pavement** – Core Borings per PennDOT standards to determine thickness and density.

99.3.10.2.11.2.4. **Nuclear Density Testing** – The CONTRACTOR shall perform density testing per PENNDOT specifications and provide reports on a daily basis.

99.3.10.2.11.3 The Contractor shall submit copies of all delivery tickets for material to the ENGINEER as deliveries are made.

99.3.10.2.12. **Concrete Pavement**

99.3.10.2.12.1. The site shall be graded to the subgrade level, proof rolled, soft spots repaired and immediately covered with the subbase material. The subbase shall consist of a 6' thickness of Type A, AASHTO No. 57 aggregate placed in conformance with Section 350 of PennDOT Specifications and the Standards of Construction.

99.3.10.2.12.2. The Concrete pavement shall be constructed in conformance with Section 501 of PennDOT Form 408.

99.3.10.2.12.3. Longitudinal joints shall be placed along the lane line as designated on the plans. Tie bars or tie bolts shall be placed at 30" centers into adjacent slabs.

99.3.10.2.12.4. Transverse and construction joints shall include tie bars and seals, all as detailed on sheet RC-20 of PennDOT Publication No. 72.

99.3.10.2.12.5. After adequate curing time and before opening the road to traffic a linseed oil protective coating shall be applied in conformance with Section 503 of PennDOT Publication 408.

99.3.10.2.12.6. Prior to opening to traffic or discontinuing of work for the winter, all joints and cracks shall be filled with an approved joint sealing compound.

99.3.10.2.13. **Berm Restoration and Backfill**—Upon completion of the pavements without concrete curbs, the berms and shoulders shall be backfilled with clean earthen materials to the design slopes and rolled or tamped. Due care shall be taken to protect the edge of pavements.

99.3.10.2.14. **Selected Material Pavements**—Selected material surfacing shall consist of uniformly graded is to be used in resurfacing driveways or other unpaved surfaces. Where such resurfacing is specified, it is the intent of this Specification that a similar material to that removed or disturbed shall be used.

99.3.10.3. **Guarantee and Maintenance**—The Contractor shall guarantee all pavement installations, including materials and workmanship. The Contractor shall make interim repairs and repairs as necessary to maintain all paved areas in good condition. The Contractor shall receive no additional compensation for pavement maintenance and restoration.

## 99.3.11. **Traffic Control Devices**

### 99.3.11.1. **Description**

**99.3.11.1.1. Scope**

99.3.11.1.1.1. Work under this Section shall consist of providing all labor, plant, material and equipment necessary to furnish and install all traffic control devices and all operations and items necessary to complete the installation in accordance with the drawings and Project Specifications.

99.3.11.1.1.2. Work under this Section includes:

99.3.11.1.1.2.1 . Line Striping and Pavement Markings.

99.3.11.1.1.2.2 . Traffic Signs.

99.3.11.1.1.2.3. Stanchions.

99.3.11.1.1.2.4 . Guide Rails.

99.3.11.1.1.2.5 . Concrete Bumper Guards.

**99.3.11.2. Line Striping and Pavement Markings****99.3.11.2.1. General**

99.3.11.2.1.1. The work shall include all final, interim and temporary markings and patterns and shall be placed as shown on the Drawings and Details.

99.3.11.2.1.2. The Schedule of Operations for temporary markings and patterns for temporary traffic controls shall be when and as directed by the ENGINEER. Temporary markings shall be completed within twenty-four (24) hours of the request for such temporary markings.

99.3.11.2.1.3. The Contractor shall be responsible for removing tracking marks, spilled paint or striping applied incorrectly or in unauthorized areas.

99.3.11.2.1.4. Temporary markings shall be removed when directed by the ENGINEER.

99.3.11.2.1.5. When necessary, the Contractor shall establish marking line points at twenty-five (25) foot intervals throughout the length of the pavement.

99.3.11.2.1.6. The Contractor shall be responsible for cleaning the pavement of dust, dirt, old pavement markings, concrete curing compounds and other foreign material, which may be detrimental to the adhesion of the striping.

99.3.11.2.1.7. The striping shall be applied only on thoroughly dry pavement surfaces, when the atmospheric temperature is at or above 60° F for plastic striping and markings and 40° F for paint striping and markings, and when the weather is otherwise favorable. Thermoplastics may be used if approved by the TOWNSHIP.

99.3.11.2.2. **Application of Pavement Markings**

99.3.11.2.2.1. Plastic Pavement Markings and Legends shall be applied in conformance with PennDOT Publication 408, Section 960 or 961 as applicable.

99.3.11.2.2.2. Painted pavement markings shall, unless otherwise noted herein, be applied with atomizing spray type striping machines. The equipment shall be compatible with and suitable for the application of the type of paint being used and shall have clean-cut edges, true and smooth alignment and uniform film thickness or 15 ± mils.

99.3.11.2.2.3. The Contractor may apply white and yellow paint, utilizing rollers and/or brushes for marking gore areas, turn arrows, letters, stop bars, short temporary detours, or other such areas.

99.3.11.2.2.4. Normal spreading rates for pavement marking paints shall be from 100 to 115 square feet per gallon so as to obtain a wet film thickness of 15 ± 1 mils.

99.3.11.2.2.5. The Contractor shall coordinate his work with that of the Traffic Signal Contractor so that all line striping required in the Traffic Signal Permits is placed when directed by the ENGINEER.

99.3.11.2.3. **Striping Schedule**

99.3.11.2.3.1. Unless otherwise noted in the Contract Documents, the Contractor shall provide marking colors as follows:

<p><u>White Markings:</u></p> <ol style="list-style-type: none"> <li>1. Solid Lane Lines</li> <li>2. Dashed Lane Lines</li> <li>3. Stop Lines</li> <li>4. Parking Stalls</li> <li>5. Pedestrian Crosswalks</li> <li>6. Words and Arrows</li> <li>7. Neutral Area Islands</li> </ol>	<p><u>Blue Marking:</u></p> <ol style="list-style-type: none"> <li>1. Handicap Applications</li> </ol>	<p><u>Chrome Yellow Markings:</u></p> <ol style="list-style-type: none"> <li>1. Solid Double Center Lines</li> <li>2. Solid Single Center Lines</li> <li>3. Fire Lanes</li> <li>4. Prohibit Parking Areas</li> <li>5. Cross-Hatched Islands</li> <li>6. Prohibited Driving Areas</li> <li>7. Parking Space Limit Lines</li> </ol>
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99.3.11.2.4. **Materials**

99.3.11.2.4.1. Plastic Pavement Markings and Legends shall be in conformance with PENNDOT Publication 408, Section 1103.14(A) or Section 1103.14(b) as applicable. Hot Thermoplastic may be used is approved by the TOWNSHIP.

99.3.11.2.4.2. Paint shall be formulated and manufactured from first-grade materials and shall be free from defects that may adversely affect the serviceability of the finished product. When the pain is stored in its container, the pigmented binder shall not liver or settle out to the extent that re-mixing is difficult by standard methods or the application is detrimentally affected.

99.3.11.2.4.3. All paint furnished must be shipped in strong, substantial and properly sealed containers. Five-gallon steel pails shall have a full diameter hub cover, wire bail and handle and shall conform to I.C.C. Specifications 17-H or 37A.

99.3.11.2.4.4. Paint shall be Sherwin-Williams Traffic marking Paint, or equal, and conforming to the PENNDOT Publication 408, Section 962.

99.3.11.2.5. **Pavement Marking Removal**—Existing pavement markings and legends that are specified to be removed shall be removed in an approved manner that will cause the least damage to the pavement surface. Removal by painting over with black paint is not acceptable.

99.3.11.3. **Reflectorized Signs**

99.3.11.3.1. **General**—As indicated in the Traffic Sign Table, Reflectorized signs shall be fabricated in accordance with these

Specifications and Details of the Drawings. In addition, all signs shall conform to the standards as specified in Title 67, Chapter 211 of the Pennsylvania Code, “Official Traffic Control Devices”. All signs shall conform to PENNDOT Publication 408, Section 930 to 936 inclusive as may be applicable to the use and mounting.

99.3.11.3.2. **Materials**—All materials shall conform to PennDOT Publication 408, Sections 1103.03 and 1103.04 as applicable.

99.3.11.4. **Non-Reflectorized Signs**

99.3.11.4.1. **General**—Those signs that are not required to be reflectorized and so indicated in the Sign Table, shall be galvanized, bonderized steel with embossed messages and borders and baked enamel finish.

99.3.11.4.2. **Material**

99.3.11.4.2.1. Aluminum shall be 18 gauge medium weight cold rolled iron phosphorized steel.

99.3.11.4.2.2. Background and message shall be of at least two (2) coats of DuPont Deluxe or equal, separately applied and baked, in color specified in Sign Table. All signs shall be given a baked over-coating of DuPont Deluxe or equal, clear varnish.

99.3.11.4.2.3. Paint shall be applied in such a manner as to obtain smooth and uniform coats, free from runs.

99.3.11.4.2.4. The finished product shall be neat and uniform in appearance. All faces shall be smooth, even and free from burrs and irregularities.

99.3.11.5. **Sign Hardware and Posts**

99.3.11.5.1. **Sign Hardware**

99.3.11.5.1.1. Nuts, bolts, and washers shall be 5/16-inch diameter and aluminum.

99.3.11.5.1.2. Nuts and bolts shall be hexagonal and made from aluminum alloy 2024 wire or rod (ASTM Specification B-211, latest issue, alloy CG42A). The thread fits for the bolts shall conform to the American Standards Association Class 2A and the thread fit for the nuts shall be Class 2B. Finished bolts and nuts shall be supplied in the –T4 temper.

99.3.11.5.1.3. Flat washers shall be 21/64" I.D. x 1/4" O.D. x .091" and shall be made from aluminum alloy Alclad 2024-T4 sheet (ASTM Specification B-209, latest issue, alloy CG42A-T4).

99.3.11.5.2. **Galvanized Channel Posts**

99.3.11.5.2.1. All galvanized posts for post mounted signs shall be of the breakaway type conforming to PennDOT Publication 408, Section 1103.07 or 1103.08 as applicable.

99.3.11.5.2.2. Post shall be plumb and driven a minimum of three (3) feet into firm ground.

99.3.11.5.2.3. All signs shall be mounted so that the bottom of the sign is seven (7) feet above the adjacent pavement grade. The height to the bottom of a secondary sign mounted below another sign may be six (6) feet.

99.3.11.6. **Stanchions**—Stanchions shall consist of 18" diameter cast iron base of 40 pound minimum weight, and two (2) inch diameter galvanized pipe standard, Catalog No. B-18, as manufactured by Lyle Signs, Inc., Minneapolis, MN, or approved equal.

99.3.11.7. **Steel Guide Rail**

99.3.11.7.1. **General**—The Contractor shall construct steel W-Beam Guide Rail (Guard Rail) at the locations and lines as detailed on the plans. All materials, workmanship and construction details shall be in conformance with Section 620 of PENNDOT Publication 408.

99.3.11.7.2. **Guide Rail Types**—The several types of guide rail shall be:

Type 2-S

Type 2-SC

Type 2-S Modified—Along the top-of-slope lines where the descending slope is 4:1 or flatter.

Type 2W—Along lines to prevent access to undeveloped or unimproved areas.

99.3.11.7.3. **Guide Rail Terminals**—The termini of all guide rails shall receive an end treatment as follows:

99.3.11.7.3.1. Full Type 2 Strong Post End Treatment adjacent to an approaching traffic lane.

99.3.11.7.3.2. Short 6" radius terminals at all other termini.

99.3.11.7.4. **Special Auguring**

99.3.11.7.4.1. In areas where random boulders are encountered and the post cannot be driven to grade, remove the post, then drill or excavate a hole of suitable dimensions and depth to place the post at grade. Reset the post and backfill to the ground line, using an acceptable embankment material, thoroughly compacted in 4-inch layers.

99.3.11.7.4.2. In areas where bedrock is encountered and the post cannot be driven to grade, remove the post, then drill or excavate a hole of suitable dimension to the required depth. Fill the hole with Class A Cement Concrete, set the post to grade, then plumb and secure until the concrete is set.

99.3.11.8. **Reinforced Concrete Bumper Guards**

99.3.11.8.1. The Contractor shall install reinforced concrete bumper guards at locations designated on the Drawings, using one bumper guard for each designated parking stall.

99.3.11.8.2. The bumper guards shall be installed concurrent with the parking lot line striping and painting and set 2.5 feet from the face of the concrete curb.

99.3.11.8.3. The bumper guards shall be of precast concrete using Class AA concrete per Section 8 of these Specifications.

99.3.11.8.4. Each bumper block shall be held in place with two (2) 1" diameter bars 24" long, driven flush with the top of the bumper block.

99.3.11.9. **Street Lighting**

99.3.11.9.1. The Contractor shall install street lighting facilities where specified in conformance with the standards of the local power company, with reference to PENNDOT Publication 408, Section 1101. Work under the Contract will include furnishing and installing pole bases and underground conduit only, unless otherwise specified in the Project Specifications. Entry to new plan must utilize the closest pole is available, if not install.

99.3.11.9.2. The Contractor shall lay out the pole bases and conduit in conformance with the plan as approved by the Power Company and install all work subject to their inspection.

99.3.11.9.3. Installation of cable and poles will be by the Power Company.

99.3.11.9.4. Conduits shall be rigid PVC Type DB meeting NEMA Specifications No. TC-6 of the size specified. Trenching and backfill shall be in conformance with Section 5.5 of this Specification. Conduits shall be laid on true lines without sharp bends or kinks, using blocking to attain uniform lines. Conduit bends at pole bases and at riser poles shall be of galvanized steel pipe. (T-6 PVC plastic pipe.)

99.3.11.9.5. The pole foundations shall be installed in firm soil in conformance with the approved plan using Class A Concrete in conformance with Section 5.8 of these Specifications. Anchor bolts and templates shall be obtained from the Power Company. The top of the pole base shall be formed and be set one (1) inch above the level of the standard sidewalk elevation.

99.3.11.9.6. Each pole shall be grounded, using a 5/8" x 9'0" rod, or as otherwise specified.

99.3.11.9.7. Street lighting must be high-pressure sodium.

99.3.12. **Fire Hydrants**

99.3.12.1. **Hydrants**—Hydrants shall be installed where and as shown on the Drawings and as specified herein.

99.3.12.2. Hydrants shall be installed vertical and plumb, with the proper cover over the hydrant lateral and proper vehicular clearance from curb line and/or edge of pavement. The installation shall provide proper access for fire department connections.

99.3.12.3. Hydrants and their installation shall conform to the requirements of the TOWNSHIP MANAGER or the TOWNSHIP MANAGER'S designated representative.

99.3.12.4. A 4'-0 by 4'-0 by 6" deep Class A concrete pad shall be installed at or near the surface around each hydrant.

99.3.12.5. Fire hydrants shall be in conformance with the TOWNSHIP standard in Section 4.7.4 of this CODE.

99.3.12.6. Where specified, Fire hydrants shall be protected with bollards. Each bollard shall be of 8" schedule 40 steel pipe filled with Class A Concrete. After installation, the bollards shall be cleaned and primed with an approved metal primer. The finish painting shall consist of two coats of rustoleum paint, or equal.

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